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BRIEFLY TOLD.

THE BOSTON MUDDLE AND AN EMOTIONAL ADVERTISEMENT.—Many queer records have been made on the pages of American gas history, but for surpassing oddity those written in connection with the gas supply of Boston and its vicinity, during the past 10 years or so, must be awarded the first place. Time was when, before and during the Greenough dynasty, the gas trade of Boston proper was carried on upon safe lines, with due regard to the needs and demands of the gas-using public, and with proper consideration for the financial obligations towards the investing public that the management of such trade implied. The old Boston Company, however, was not to remain unattacked, and possibly it was itself to blame somewhat for the final assault, since its management in the last days of the Greenough *regime* was too strongly marked with staidness rather than by progressiveness. What is meant in the latter presentation is not in any sense to be applied to its engineering direction, which always was (in fact, it is so to-day) of a high order, but should be attributed to its financial management, which in the end was altogether too restricted and self-exalted—a very unfortunate combination in these times of the tendency of capital to turgidity. But the change in the Boston gas situation, since the time that the Greenoughs retired, to be succeeded by the Addicks combination, has been marked enough to satisfy even those who are most opposed to things that were. In fact, he who could at the present time say where the equity is in the Companies popularly said to be in the Bay State gas combination of Boston, and tell who owns such equity, would be hailed with acclaim as a man before whom Mr. Morgan or Mr. Keene, as manipulators of deals, would be as none, and in fact, he could easily take from Mr. Sage all the laurels, as the possessor of an insight over financial possessions and possibilities, that now rest so undisturbed on that benevolent gentleman's head. In the maze of the past and present (to say nothing of the haze which conceals the future) we shall make no attempt to earn the fame that, under the circumstances and in the premises, awaits the possessor of the heretofore suggested equitable knowledge, and will take leave of that part of the subject by remarking in a general way that the gas situation in Boston proper and its suburbs, so far as the financial aspect thereof is concerned, is nothing more, nothing less, than disgraceful. The particular reference we would make to the Boston situation hinges upon an advertisement, published last week in certain influential daily newspapers, at so much per line in the advertising columns, at the instance of Mr. Thomas W. Lawson, under date of December 14th. Mr. Lawson, in this advertisement, states that he has been a leading officer in the five Boston Companies, the properties of which underly the mortgage issues, denominated "First and second series, United Gas bonds," and through the knowledge thus gained he did some time ago advise the purchase of "firsts," at 60, and of "seconds," at 40. Since that advice was originally given, and as both sorts of "Uniteds" have sold and are selling at materially higher prices, and because of other information that Mr. Lawson has since acquired, possibly in his character of a "broker," he now advises the sale of both classes of bonds. He who will take the trouble to read between those lines will readily be able to form some sort of opinion as to the character of a man who, as a leading officer of a Company, advised, as a broker, the purchase of bonds in that Company from any cause whatever, and who now, in his capacity of broker, advises the sale of the bonds because "occurrences of the last 60 days in my opinion have seriously undermined these bonds, and events which will culminate within the next few days I know will put in jeopardy not only their interest but their principal." And he who reads "those few lines" from Mr. Lawson's "ad." need not look between them to determine that, if the interest and principal are to be put in jeopardy, it is hardly honest advice to suggest a sale of the bonds at all, since every bond that is sold must also be bought. However, it is fair to assume, from the tenor of the "ad.," that Mr. Lawson is a firm believer in the idea that the devil should take the hindmost, and in fact we are afraid that Mr. Lawson is just now travelling well in the ranks of the hindmost, so far as his financial interests in the Boston gas situation are concerned. The next time he "prepares" an advertisement he should hire someone to arrange it whose knowledge of such things is more on the convincing than the emotional order.

"OBSERVER" HAS A WORD TO SAY ON THE BOSTON SITUATION.—"Observer," writing under date of the 14th inst., says: "The recording of the very large mortgage of $17,000,000 by the New England Gas and Coke Company, coupled with the announcement of the purchase

by it of the Brookline, Dorchester and Jamaica Plain Companies, together with the control of the Bay State, Boston, South Boston and Roxbury Companies, would seem to indicate that another epoch in the history of Boston's gas business was beginning. Less than 10 years ago the so-called Boston gas field was supplied by six Companies with capital as follows:

Company.	Capital.
Boston	$2,500,000
Roxbury	600,000
Brookline	450,000
South Boston	440,000
Dorchester	400,000
Jamaica Plain	200,000
Total	$4,590,000

To-day the same field is supplied by Companies having stocks and bonds as follows, as stated by a writer in the Boston *Herald:*

Company.	Securities.
Bay State, of Delaware (capital)	$50,000,000
" " (income bonds)	2,000,000
" New Jersey (capital)	1,000,000
" Massachusetts (capital)	2,000,000
Boston Gas Light Company	2,500,000
Brookline (capital)	2,000,000
" (bonds)	1,000,000
" (floating debt)	1,600,000
Roxbury (capital)	600,000
Dorchester (capital)	472,000
South Boston (capital)	440,000
Jamaica Plain (capital)	250,000
Boston United (bonds)	12,000,000
	$75,862,000

To which is to be added soon:

New England Gas and Coke (stock)	14,000,000
" " " (bonds)	14,000,000
Mass. Pipe Line (stock)	1,000,000
Total	$104,862,000

The total gas sold is about 2,500,000,000 cubic feet, yielding, at $1 per 1,000 cubic feet, $2,500,000, and it is an interesting study to calculate the per cent. of dividends which could be paid, if gas could be made and distributed for nothing; or, again, if the Bay State, of Delaware, stock were thrown out; or, still, again, if nothing but bonds were taken on which to earn interest! That these securities (if they may be called such) overlap, of course, goes without saying, and the actual capital stock upon which Boston's gas consumers must pay interest is difficult to determine. It is sufficient to know that it is far beyond the needs of the community. The Company now in control proposes to erect a large coke oven plant in the suburban town of Everett, and from Dominion coal, which the older gas men will remember under the title of Pictou, Glace Bay, etc., produce a coke for railroad purposes, tar and ammonia, leaving the gas to be sold under a long term contract, to the Boston Companies. It is asserted that the gas will be produced at a marvelously low figure, but inasmuch as the price of coke, tar and ammonia cannot be determined until the quantities derived are put upon the market, it is a question if the usable gas output will be produced in large quantities as cheaply as water gas, or even as cheaply as coal gas is produced to-day, considering the favorable price received for residuals The Harbor and Land Commissioners have granted permission to the New England Gas and Coke Company to drive piles and to fill in its land at Everett, and contracts are being made for the coal sheds and coal handling apparatus. It is stated that the works will be running in another year."

NOTES.—"Observer" notes, as illustrating the depreciation which takes place in electric machinery, etc., that the Boston Electric Company has applied to the Board of Gas and Electric Light Commissioners for permission to issue $800,000 of new stock, the money to be expended in building a new central station, to replace all their old stations except that at East Boston.——An explosion and fire occurred, Monday, the 13th inst., at the gas plant operated in connection with the plant of the Naumkeag Cotton Mills, Salem, Mass. The damage was slight. ——The proprietors of the L. R. Medbury Gas Works, Pontiac, Mich., have purchased the local electric light works.——At the annual meeting of the Lancaster (Pa.) Gas Light and Fuel Company the following Directors were elected: J. I. Hartman, H. C. Demuth, W. U. Hensel, D. McMullen, H. M. North, Geo. R. Rohrer, J. F. Sener, J. D Skiles, P. B. Shaw, P. T. Watt, H. S. Williamson, N. M. Woods, J. Z. Zook, J. H. Baumgardner and J. C. Carter.——The Wright Gas Company, of Loraine, Ohio, and the Lake Erie Electric Light Company, of the same place, have been consolidated. Senator Wright remains in control of the joint enterprise.——Mr. W. H. Bradley, Chief Engineer of the Consolidated Gas Company, of New York, accompanied by Mr. L. B. Gawtry, Purchasing Agent of the Company, is due to reach home on the arrival of the Kaiser Wilhelm der Grosse, at New York, to-morrow. The ship sailed from Bremen on the 14th inst.

Sulphate of Ammonia.

[A paper read before the Manchester District Institution of Gas Engineers, by MR. E. A. HARMAN, of Huddersfield.]

Sulphate of ammonia is a subject which is at the present moment rightly occupying a considerable amount of prominence among us; and in view of the recent steps taken by the formation of the Sulphate of Ammonia Committee in London (of which I have the honor to be a member), I considered that a few passing remarks upon it might be of general interest, not so much in conveying anything either novel or new, as more especially to keep the object we all naturally desire so much—namely, an improved market—before us. I shall also hope to elicit from the more experienced members their views, and information as to the best methods of manufacture. It has often happened that a topic of common interest has been as useful to the many as an abstruse one necessarily confined to the few, if not actually to specialists; so that, though we may have to confine ourselves to trifles, yet it has been found worthy of record that Michael Angelo said: Trifles make perfection; and perfection, let me tell you, is no trifle." It is with this hope I venture to make a few observations to this important Institution.

There are various methods for the disposal of ammoniacal liquor obtaining among us. We have, for instance, in small works in country places, the system of simply running the liquor, or "gas water," as it is termed, into ditches, drains, or anywhere else available. This may be safely described as distinctly primitive. There are others making an endeavor to save a portion of their ammonia, by a plant which would have done credit to antediluvian days, up to the time when the Ark was pitched within and without, but which is nevertheless a step in the right direction. Others have a properly designed and efficient plant for the manufacture of sulphate of ammonia, finishing with oxide of iron purifiers for the treatment of waste gases, and——for the benefit of the Alkali Inspector. Some, in addition, have the further desirable equipment of a sulphur recovery plant. Others are concentrating their ammoniacal liquor, and disposing of it at a very high strength to the chemical manufacturers for the recovery of cyanogen. Some works are purchasing their oil of vitriol from the chemical manufacturers, while others are treating their own spent oxide, and manufacturing the sulphuric acid on the works for subsequent use. When the ideal method of purification in closed vessels is reached (concerning which Mr. James Stelfox, of Belfast, has placed the gas world under a large indebtedness for his exhaustive and valuable experiments), other arrangements will still remain to be made.

Those of us who had the privilege of inspecting the splendid gas works upon the Continent at the autumn meeting of the Institution of Gas Engineers, must have been struck by the excellence of the sulphate of ammonia plants, as well as the cyanogen and tar distillation works. When one thinks of the splendid buildings and plant allotted to this portion of the works, one also remembers with somewhat of shame the holes and corners to which too often such plants are relegated in works in the United Kingdom. Fortunately, there is an upgrade movement among gas undertakings, to raise the more distinctly chemical departments to a higher position, rather than, as has too often been the case, of making them a sort of happy hunting ground for scrap iron, boshes, tanks, pipes and other material almost worthless for any other purpose on the works or district.

In Huddersfield, we have Dr. Feldmann's system in operation; and it is certainly a most valuable one. Permit me to hurriedly glance through the process as illustrated in the diagrams. Others will be able to improve upon the description to our mutual benefit, should they desire. Referring to the diagrams, it will be seen that the ammoniacal liquor is pumped from the storage wells into the tank or reservoir *A*, from whence it gravitates to the superheater *B*, in which it is heated by the waste gases from the saturator *H*. From thence it flows in a continuous stream into what may be termed the free ammonia still *C*. It here falls from one small tray *T* to another, being constantly exposed to the hot gases and steam given off below, which are passing upwards. After passing the trays, it falls into the lower portion of the still, where milk of lime is forced in by the pipe *E* from the mechanical lime mixer *F*; and steam enters through the pipe *O*. A great deal of the fixed ammonia is here given off; but to further secure the whole of it, the mixed lime and ammoniacal liquors are once more caused to pass down another series of trays in the fixed ammonia still *D*, where a further supply of steam is admitted by the pipe *O*; the effluent liquor passing away by the tap *W* into the drain at bottom.

The above is the ordinary course of the liquor. The steam from the boiler passes along the pipe *O*, where it is governed down from the

boiler pressure to about 10 pounds, at which it enters the stills *C* and *D* as indicated. The ammoniacal and other gases evolved in the stills *C* and *D* pass along the leaden pipes into the saturator *H*, in which they come into intimate contact with sulphuric acid of a strength of between 54° and 58° Twaddel. From the acid tank *P* a charge is run into the saturator *H* at about 150° Twaddel, and is reduced to about 70° by water from the tank *R*. In the saturator, the ammonia gases neutralize the acid, which thereupon deposits its crystals at the bottom—$2NH_3 + H_2SO_4 = (NH_4)_2SO_4$. These crystals are removed either by a scoop, ejector, self-discharging apparatus, or any other approved means.

The importance of using clean water for reducing the sulphuric acid is apparent, if the color of the salt is to be good. It is also most desirable that the saturator is kept as free from salt as possible. The gases not absorbed by the acid pass away by the pipe *J*, through the acid arrester *K*, into the superheater *B*, where they impart some of their heat to the inflowing liquor. They then pass through the tube condenser *L* and coke scrubber *M*, and onward to the oxide purifiers *N*, there diffusing away into the atmosphere. In many works the waste gases pass through sulphur recovery kilns and plants.

The essential constituents of a sulphate of ammonia plant are smiply a suitable still—Coffey or other—in which the ammonia is liberated from its solution and salts ; and a saturator, in which the acid receives the vapors given off. As you are aware, the designs of such are numerous, while the systems in use are intermittent or continuous. The whole working consists of first charging the saturator with reduced sulphuric acid of about 70° Twaddel strength, and when sufficient ammoniacal gases have passed through, the crystals begin to deposit at the bottom, from where they are removed by the attendant. But there is a further change taking place. The acid used is gradually becoming weaker and weaker, and this has to be noticed and its strength kept up by the addition of further strong acid as required. This is ascertained by the use of a hydrometer. When the acid in the saturator sinks to 54° Twaddel, it is replenished and made up to 58°. The salts removed are placed upon a drainer *S*, consisting of a flat, lead lined, sloping tray, overlapping one edge of the saturator itself, from which the mother liquor drains back into the saturator. The salt thus formed is, or should be, quite white when the crystals are thoroughly dried; but this is rarely obtained when the material has to be heaped upon itself to the depth of several feet. The store in which the sulphate is kept is lead lined, having suitable draining channels leading to a receiver, the liquor so drained being again put into the saturator and reused.

Several methods and systems have been adopted for making use of the waste gases, thereby saving the expense of their purification, and recovering the value of their constituents. A large quantity of the gas given off from the ammoniacal liquor is sulphureted hydrogen. To recover the sulphur from these gases requires a simple arrangement of sulphur kilns, etc. In the Claus patent apparatus, the sulphureted hydrogen is made to pass, with a regulated quantity of air, through a suitable kiln, in which oxide of iron is kept at a required temperature. The sulphureted hydrogen attacks the ferric oxide, reducing it to the ferrous state in the form of sulphide, with liberation of water. But the air which is admitted at the same time also seizes upon the ferrous sulphide, and reconverts it to the ferric state again, with the result that the oxide is revivified and the sulphur liberated in the free state. This sulphur, at the temperature of the kiln, assisted by the heat evolved in the reaction, is carried forward and deposited in the cooling chambers which follow. This is undoubtedly a splendid method ; the principles which direct it underlying every endeavor to avoid waste, and the theory that everything produced has a value which might pay for recovery, even if it does not do more. There is also the important factor of the total abolition of nuisance arising from the dispersion of the waste gases into the air—a necessary condition in a crowded neighborhood.

With regard to the waste liquor after the abstraction of the ammonia, various methods have been patented for recovering the cyanides as a further source of profit. Roughly speaking, they consist of modifications of combining the cyanides with iron salts, the liquor running from the stills being cooled in tanks, decomposed with iron salts, and the supernatant liquor strained and precipitated in the form of a copper compound by copper salts. In such processes, use is made of the waste gases given off for various purposes. The sulphureted hydrogen is employed to form ammonium sulphide ; and it is further burned in suitable burners to produce sulphurous acid gas, which is used in the production of cyanide from the liquor. Speaking generally of existing plants, it seems to me that there is plenty of room for improvements, and such are being effected constantly.

Circular stills are, in my judgment, faulty in design ; and I am glad to notice in many works the adoption of a rectangular form of still, which provides for properly cleaning out the trays from any stoppage that may arise.

The saturator receives pretty much attention. Mr. Wilton's patent ejector deserves commendation, as well as the form of self-discharging apparatus—such as Mr. Davis' patent, and that illustrated by Mr. Ellery in a paper he read upon the subject in Edinburgh in June, 1895. Messrs. C. & W. Walker have also an improved form of this self-discharging apparatus, as shown on the diagram upon the wall, which well answers all requirements. As a further contribution to the subject, Mr. William Maltster has patented an ingenious arrangement for clearing the saturator, as shown in the diagram. This form of apparatus is a very simple and efficient means of lifting the sulphate from the saturator. It has been in use at the Crystal Palace District Gas Works for many years, without any trouble or difficulty in the working ; and it has, I understand, given great satisfaction. The bottom of the saturator slopes both ways towards the corner in which the lifter is fixed, so that all the salts gravitate to this corner. To my mind, what is required for the salt itself is that it should be moulded, either in a briquette machine or in some other way, to a suitable size for handling, instead of being put into bags.

The lime mixer generally consists of a few revolving arms in a circular bosh, or of the form of a churn. As it is important that the mixing should be done as effectively as possible, this may perhaps be worth a little consideration. Upon the wall, I have an illustration representing Gabbett's patent rapid mixer manufactured by Messrs. Young & Co., of Pimlico ; and upon the table there is a small model of the same. Though this form of mixer was originally designed for sewage tanks, and is largely used for this purpose by the London County Council and other undertakings, yet it is suitable in every respect for lime mixing, or, indeed, for any other purpose where rapid and perfect mixing is desired. The ingenious change-valve for the purifiers made by Messrs. C. & W. Walker, concerning which the Alkali Inspector spoke so highly in his last year's report, is well worthy of adoption.

Directly or indirectly, all gas works are concerned in the manufacture of sulphate of ammonia ; and it is a common question as to how small a works it pays to put up a plant for. My own conviction is that there are no works too small for a plant of some size or other to be profitably worked.

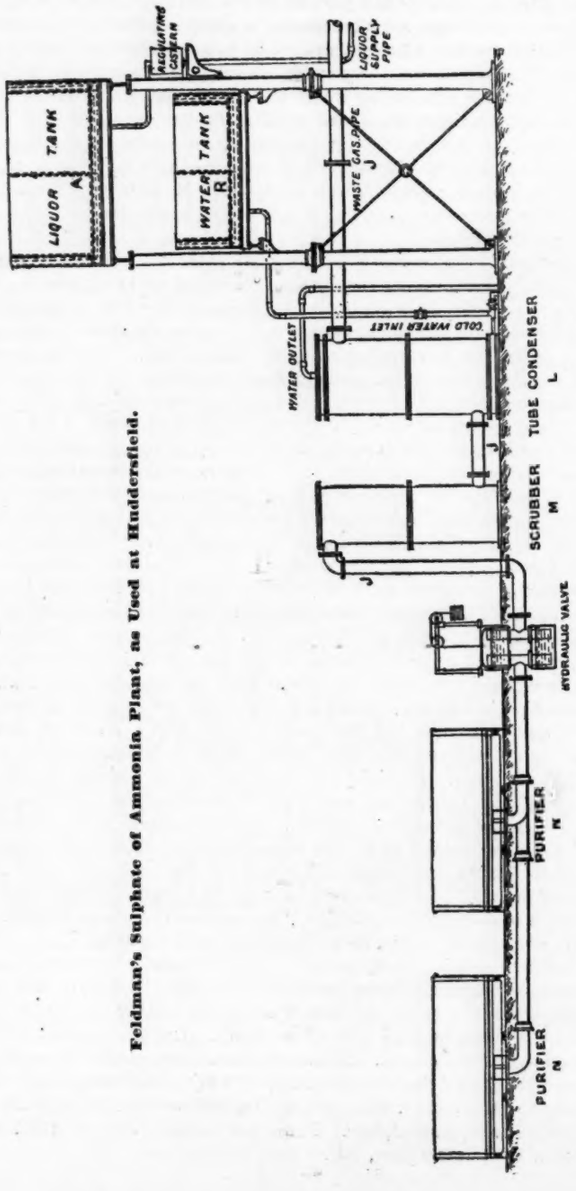
As regards the market for sulphate of ammonia, we have, as has often been pointed out, by the distribution of gas works all over the kingdom, as splendid an organization as could be desired for bringing under the farmer's notice the qualities of sulphate for manurial purposes, as well as the best mixture for different kinds of soil. What it seems to me is lacking is a central authority, advising as to the position of the market and disposal of stocks, from whom the best possible information upon any matter connected therewith might be obtained. I would suggest, further, that some arrangement for analyzing different soils might be advantageously employed. A farmer might take an average quantity of soil from all over a large field, mix the same, and send from the mixed bulk a small sample to the gas manager, who might then forward it to such central station for analysis, and advise accordingly. In many cases the analysis would show it to be deficient in nitrogen, and sulphate of ammonia could be recommended. In instances where it was apparent other food was required, the fact could be honestly stated.

If I may be allowed to digress from the immediate subject of the paper, I would say that what is needed for gas interests generally, in the face of the competition to which they are subjected, is a National Institution in London, having a hall suitable for association meetings (without having to beg for one), together with a reference library, reading room, secretarial and other offices, a laboratory and correspondence room. It might also be available as the offices of all the London Gas Institutions and kindred societies, and could contain a show room of stoves, burners, etc. Such a central station might be built and maintained by annual contributions from gas undertakings. It would form a rendezvous and center for gas engineers from every part of the world, when visiting London, and would prove, I am confident, a considerable acquisition of strength to the gas profession.

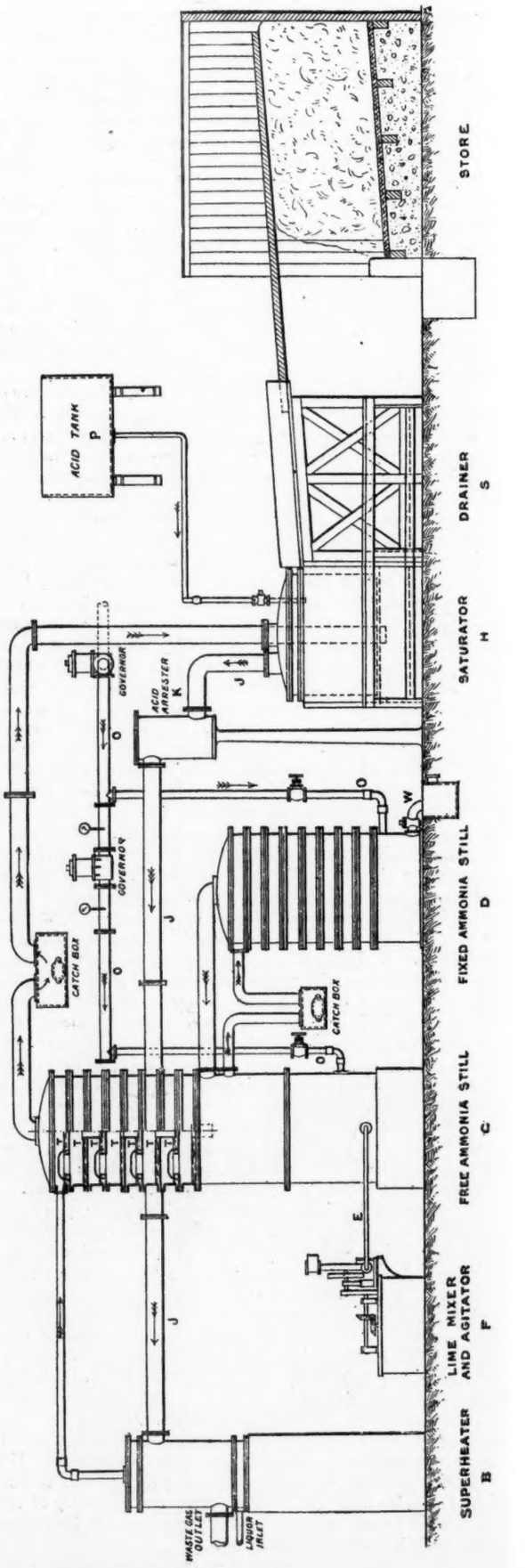
Mr. Carulla, of Derby, recently suggested an alteration in the name of sulphate as being likely to be an improvement. One would think, "a rose by any other name would smell as sweet." Yet, on the other hand, it would not be the first time in the history of a trade that a change of name has had a beneficial result. Certain it is that distinctive names have a charm. His suggestion that "ammonium sulphide" should be adopted deserves attention. To the commercial world it involves no real change, while prominence is given to the ammonia idea in preference to the sulphur. Too often farmers connect the idea of sulphur with destruction, rather than with growth.

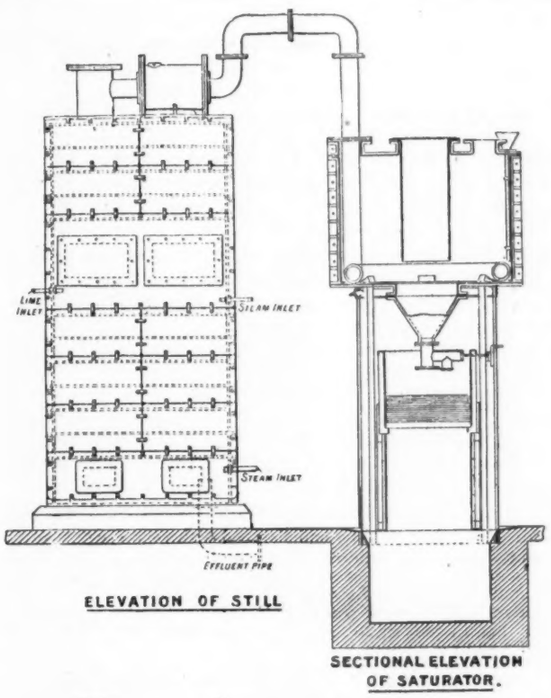
It is likely something more might be done in the way of selling manures mixed ready for use, but for the extra cost of carriage. Here is the great anomaly. While we are exporting sulphate of ammonia containing 20 per cent. of nitrogen, we are importing nitrate of soda containing only 15 per cent.—or of 25 per cent. less value, and neces sarily at 25 per cent. increased cost for carriage bulk for bulk alone. The mixture of prepared manures might be extended advantageously for amateur gardners, etc., but would probably not amount to much.

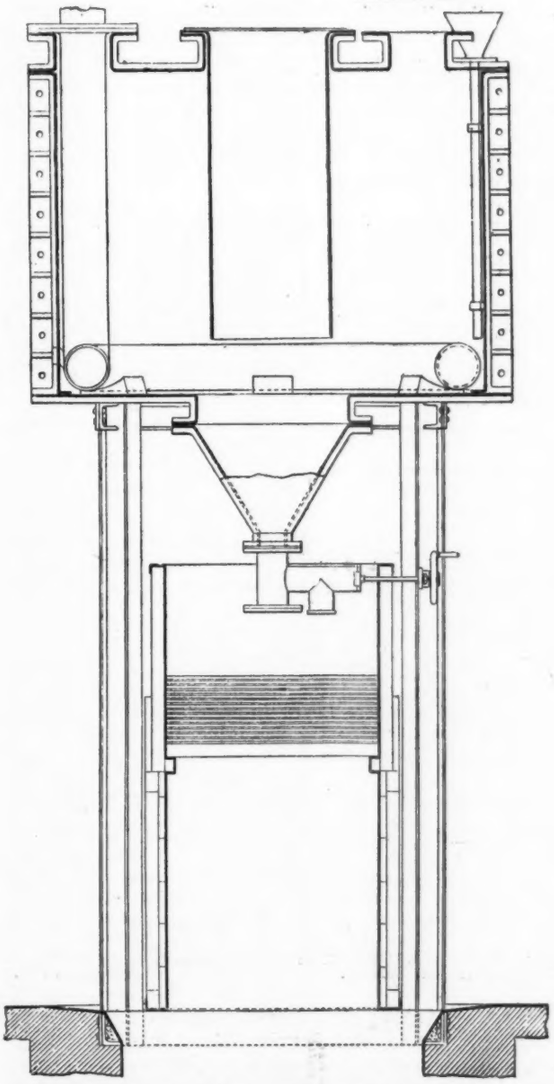
It is a question as to whether we give as much attention to the sulphate of ammonia market as we ought, considering the extent to which gas works alone are responsible for its production. The subject is one which will claim further consideration at regular and frequent intervals. We receive advices now and again from different brokers, informing us of the state of the market, or possibly the absence of any market worth naming. At intervals we peruse pamphlets upon the subject; but rarely do we, individually or collectively, undertake research or experimental work. We have an article of intrinsic value, which we are producing, and are compelled to produce; and yet for many years we have allowed ourselves to be almost ousted from the market by an inferior competitor. Chemically we know it is one of the best nitrogeneous manures; but practically we have not given it the attention it deserved. Thanks, however, to the efforts of Colonel Sadler and Mr. W. G. Blagden, the Sulphate of Ammonia Committee in London are now energetically taking the matter up; and backed by individual members of Institutions such as this, good work must undoubtedly follow. The time is singularly opportune. With the break up of the Nitrate Combination, and other complications ensuing there-



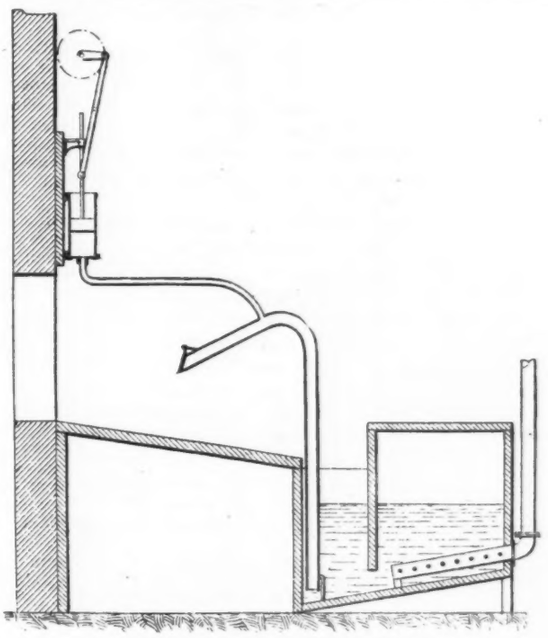
Feldman's Sulphate of Ammonia Plant, as Used at Huddersfield.







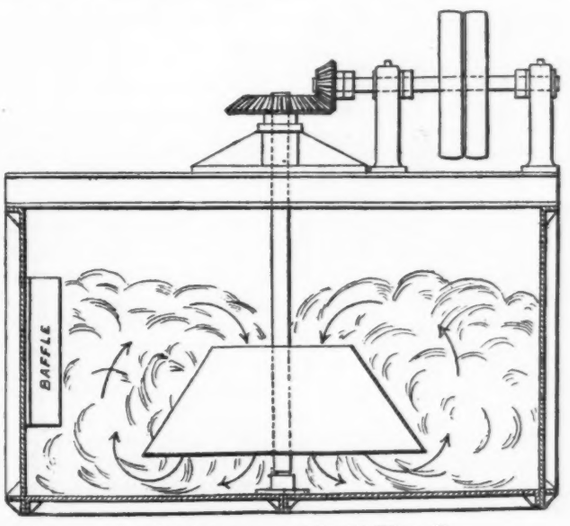
Walker's Still and Self-Discharging Saturator.



Maltster's Patent Sulphate Lifter.

from, sulphate of ammonia has now a chance to step into the breach and exert its utmost influence to prove its genuine merit. It is a singular coincidence that an improvement of the market is taking place with the operation of the Committee. I will not enter into the manurial side of the question, except to remark that soils require some dozen different kinds of food—such as oxygen, hydrogen, nitrogen, carbon, sulphur, etc., etc. Our particular interest is in nitrogen; and this will be dealt with later on in a far abler manner than I can possibly attempt.

Much has been done, but much still remains to be done, to educate farmers and agriculturists to a knowledge of the value of artificial manures; and it is for us to take our part in disseminating information respecting the product which we have always available. If each member would make it his duty to secure the co operation of one farmer per annum, an immense stride would be made in a year or two in the development of sulphate of ammonia for manurial purposes at home. A



Gabbett's Patent "Rapid Mixer."

splendid example has been set us in Jersey by Mr. Joseph Morris, the respected Engineer and Manager ther , the results of which were ably set forth in Mr. Ritson's paper read a few years since before the Gas Institute. But we must bear in mind that Jersey is peculiar as to the use of artificial manures; some $300,000 a year being paid for the various ingredients. The land is dressed so very heavily that three crops per annum are usual. While we cannot, of course, expect such

results as these, yet an improvement may be looked for, and not in vain.

While the majority of us are conversant with the fact, allow me just to remind the younger members of our Institution that ammoniacal liquor is much more effective in extinguishing fire than water.

The output of sulphate from gas works, owing to the rapid adoption of water gas processes, from which no ammonia is obtained, is unlikely to increase. In America, this displacement of coal gas has reached an enormous extent, and will probably increase still more. There is, however, every prospect of an increasing supply from those large iron, carbonizing and oil works, in some of which hitherto bye-products have not been properly dealt with.

The quantity of sulphate per ton of coal carbonized varies according to the methods of working and coals used; but it is considered good work to obtain between 25 and 30 pounds per ton. In chemical works, where the quality of the gas is a secondary consideration, far more than this is secured.

There is one little detail I should like to call attention to—that is the importance of seeing that all the seal boshes upon the works have perfectly tight lids and covers. The loss of ammonia resulting sometimes upon the top of a retort bench, or from a sealing bosh fixed on a wall or in an out of the way position, is small, but at the same time worthy of note. Everything containing ammoniacal liquor should be sealed up.

The importance of having sufficient scrubbing power is too apparent to emphasize. In the summer months we hear of the difficulty experienced in keeping the scrubbers clean. This staining, though slight, of course involves loss. A periodical test for the soundness of liquor storage tanks would insure that loss was not arising in this direction.

If the result of this paper produces an increased interest in the subject of it, I shall feel amply repaid for the little trouble taken in its preparation.

The Importance of Quality in Incandescent Lamps.

By Mr. Francis W. Willcox, in *Electrical World.*

We smile at the child's definition of an incandescent lamp—"A hairpin in a bottle," but there are numerous consumers and purchasers of incandescent lamps to whom it is nothing more, who never have understood or appreciated the difference between good and poor lamps, or esteemed the great importance of quality.

One of the greatest drawbacks to successful electric lighting to-day is inattention to lamp quality, disregard of the proper value of a lamp, its quality, and consideration only of the apparent value—first cost. Poor quality lamps are like barnacles on a ship—they retard the free progress of successful illumination and convert what might be an active and successful business into a slow and uncertain one, unable to do much more than drift at the mercy of the waves of gas and oil competition, and fortunate if indeed it escape utter shipwreck.

The importance of quality in incandescent lamps can hardly be exaggerated. The lamp is the end and aim of the whole lighting system. It is the final translating device which transforms the current into light. Its quality becomes, therefore, like an object at the focus of a microscope, magnified into the greatest importance.

There is little dispute but that it is the best to use good and efficient machinery in electric lighting stations, that it is wise to have a well-proportioned and constructed distributing system. How then can there be any question of what should be an electric lighting axiom? viz., That only incandescent lamps of the highest quality should be used. What folly for a station to install good machinery and well proportioned lines to supply current to poor lamps. It would be as wise for a steamship to have quadruple expansion engines to drive an inefficient propeller.

A good incandescent lamp often overcomes the result of bad machinery or bad management, but poor incandescent lamps will destroy the results and efforts of the best equipped and most capably managed electric lighting installation in the world.

There can be honest differences as to whether it is wisest or best to buy the best wire, or this or that cut-out, or a cheap type of socket in preference to a more expensive one, but as regards the lamp there can be but one decision—the best lamp is none too good. This is because the lamp is the chief and final device that produces the light and establishes the quality of the commodity for sale.

There are many who will probably concur in all that has been said to the extent of avoiding the poorest grades of lamps, but who do not consider that minor differences of quality are of any importance, and who actually believe that it is economy to purchase lamps, even if they are inferior to the best, provided they can be bought cheaper.

It is the purpose of this article to point out the error of this, in demonstrating the great importance of quality and how many times more important it is than any saving in first cost.

The quality of a lamp is determined by the average light it furnishes during any given period. As is well known, all lamps decline in candle power as they are used. It is the relative amount of the decline, other things being equal, which determines the value of a lamp.

Fig. 1, for example, gives the curves of candle power of two lamps, and the quality of lamp No. 2 is at once seen to be superior to that of lamp No. 1 in the better holding up of the curve of candle power. Both lamps are of similar voltage and candle power, and were tested at the same exact initial efficiency under the same exact conditions. It is the practice of the best modern stations to take the period in which a lamp loses 20 per cent. of its initial candle power, and from this determine the candle hours of light given, taking these as the measure of the lamp value. The area included between the candle power curve above the 80 per cent. value and the zero line of candle power gives the candle hours. All the lamps tested were between 16 and 20 candle power and burned on voltages of 115 to 120. They were tested at an initial efficiency of 3.1 watts per candle.

For example, in Fig. 1 the area enclosed beneath curve No. 2 is indicated by the letters *a b c d;* that beneath curve No. 1 by *a e f d.* By means of a planimeter these areas are measured, and with proper scale of candle power and hours, the areas represent the exact number of candle hours given by the lamps under consideration. The areas of the lamps Nos. 1 and 2, in Fig. 1, have been integrated by a planimeter, and are as follows:

Area of lamp No. 1—*a e f d* equals 1,500 candle hours.
" " " 2—*a b c d* " 6,000 " "

Comparison of the two curves, Nos. 1 and 2, shows that lamp No. 1 reaches the 80 per cent. line in about one-fourth of the time that lamp No. 2 does. To obtain the same amount of light, it would be necessary therefore to renew lamp No. 1 about four times as often as lamp No. 2, which on the basis of first cost of the lamps would make lamp No. 2 four times the value of lamp No. 1, and this we see is the ratio of the respective candle hour areas.

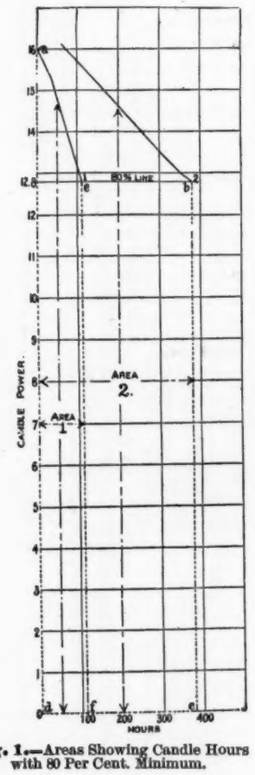


Fig. 1.—Areas Showing Candle Hours with 80 Per Cent. Minimum.

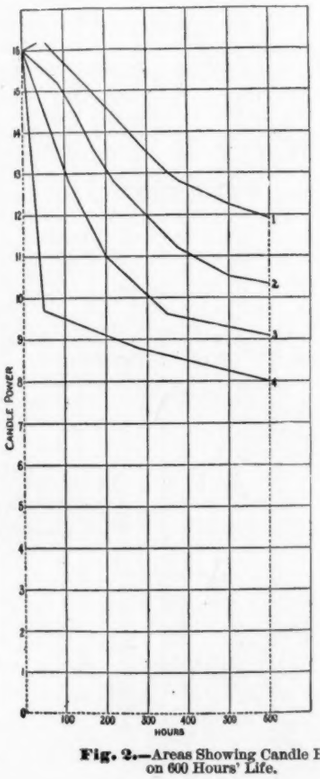


Fig. 2.—Areas Showing Candle Hours on 600 Hours' Life.

This method of comparison correctly and fairly determines the value of any make of lamp, but it is quite difficult, if not impossible, for the average station to determine when a lamp has lost a given percentage of its candle power, and, therefore, difficult to renew lamps on this

basis, that is, replace lamps whenever they have lost 20 per cent. of their initial candle power.

If there was a practical plan for the average station to renew all lamps on its circuits at the period when the candle power had diminished to a certain degree, it would be far preferable to the present generally accepted methods of letting lamps burn until they burn out or get so dim as to be practically useless, or of allowing them to burn a fixed average life of 600 to 1,000 hours; but as the most prevalent practice is to let lamps burn for a given number of hours, we will adopt a modification of the foregoing method of determination of quality.

We will extend the curves of candle power to 600 hours and take the area beneath each of these curves in candle hours as the measure of value. The various makes of American lamps have been purchased and tested and classified into four grades. The accompanying diagram (No. 2) gives the curves corresponding to each grade.

Taking the areas included between each curve up to the 600-hour line and the zero line of candle power, we have:

Area of lamp No. 1 to be 8,200 candle hours.
" " " 2 " 7,500 "
" " " 3 " 6,500 "
" " " 4 " 5,450 "

Assuming area of lamp No. 1 as the standard representing it by 100 per cent., the difference in candle hours given and the percentage value of the other lamps, is as follows:

Relative Value of Lamps.		Difference in Candle Hours of Light as Compared to Best Lamp.			
No. 1....	100 per cent.	No. 1....			
No. 2....	91 "	No. 2....	700	candle hours or	9 per cent.
No. 3....	80 "	No. 3....	1,700	" "	20 "
No. 4....	66 "	No. 4....	2,750	" "	34 "

From these comparative values one might conclude that if lamp No. 1 costs 20 cents, then lamp No. 2 would be worth 91 per cent. of 20 cents, or 18.2 cents; lamp No. 3, 80 per cent. of 20 cents, or 16 cents, and lamp No. 4, 66 per cent. of 20 cents, or 13.2 cents. This result, however, only considers the first cost or selling price of the lamp. A proper measure of the differences in quality as compared to the best lamp should consider the cost of the difference in candle hours—*i. e.*, the value of the light lost. What is the value of this difference in candle hours or lost light, ranging from 9 per cent., or 700 candle hours in lamp No. 2, to 34 per cent., or 2,750 candle hours in lamp No 4?

Assuming the station cost of a lamp hour at the low value of ¼ of a cent, the value of 600 hours of the best lamp would be $1.50. On this basis of the value of the light given by the best lamp, the value of the candle hours difference, or the light lost by using lamps Nos. 2, 3 and 4 is as follows:

Lamp No. 2. Difference or light lost, 700 candle hours, 9 per cent.; value 13.5 cents.

Lamp No. 3. Difference or light lost, 1,700 candle hours, 20 per cent.; value 30 cents.

Lamp No. 4. Difference or light lost, 2,750 candle hours, 34 per cent; value 50 cents.

If now we assume that the lowest grade lamp, lamp No. 4, could be purchased for 1 cent, the values of lamps Nos. 3, 2 and 1, when the cost of the difference in candle hours of light is considered, would be as follows:

Lamp No. 4 assumed as worth..... 1 cts.[1]
" " 3 becomes worth..... 21 "
" " 2 " " ..... 37½ "
" " 1 " " ..... 51 "

This table strikingly shows the value of the difference in quality of incandescent lamps. It is to be noted that this value is estimated upon a very low basis of cost—¼c. per lamp hour.

From the standpoint of the customer, who pays at least three times the cost assumed above, that is, ¾c. a lamp hour, lamp No. 1 becomes worth $1.50 as compared to 1c. for lamp No. 4. It is from this, the customer's standpoint, that the matter should be regarded.

Whether it be as a result of supplying poor lamps, or allowing supply houses to sell customers poor lamps, the loss to the consumer is direct and paid for in dollars and cents. The fact that the customer purchases the inferior lamp does not relieve the station from blame or the responsibility of the loss in value of light. The customer can hardly be expected to know or appreciate the value of lamps—it is the station's business to protect him by furnishing or allowing to be sold to him only lamps of the best quality. Otherwise there is dissatisfaction and loss of business, as the customer always blames the station for poor service.

The answer to those who consider minor differences in quality unimportant is found in comparison of lamps Nos. 1 and 2. Here there is only a difference of 9 per cent. in candle hours of light given, and yet the value of lamp No. 1 (51 cents) is 13½ cents greater than that of lamp No. 2 (37½ cents) estimating light at cost value. Estimating light at what it costs the consumer, the difference in value between the best and the next best lamp is more than 40 cents.

We have assumed a very low figure for lamp No. 4 in taking its value at 1 cent in order purposely to emphasize the difference between the best and the poorest lamp. As a fact, the selling price of the poorest lamp made is only a few cents below that of the best.

Where can be the gain to a central station in saving 2 or 3 cents on a lamp and losing 50 cents' worth of light; or, from the customer's standpoint, where is the wisdom in supplying customers with a lamp 2 or 3 cents cheaper than the best on the market, and causing him to lose an amount of light which represents $1.50 in value to him?

Were central stations to ask themselves such questions and give more consideration to this subject of quality, there would be fewer stations suffering from Welsbach competition and unprofitable lighting business.

1. Lamp No. 1 is worth 1 cent, plus the value of lost light—50 cents—or 51 cents. Lamp No. 2 is worth 1 cent, plus the difference in value of lost light between lamp No. 4 and lamp No. 2; that is, 50 cents—13½ cents, or 36½ cents, plus 1 cent, giving 37½ cents. In same the value of lamp No. 3 is estimated.

Engineers—Consulting, Inspecting, Contracting—Their Relationship to Each Other and to their Clients.

[A paper by MR. GEO. W. DICKIE, before the Technical Society of the Pacific Coast.]

In opening up the questions that naturally gather around the title of this topical subject, I do not expect to be able even in the most limited sense to do so exhaustively with regard to anyone of the divisions under which I desire to arrange my remarks.

My object in presenting this subject now, is to bring out, if possible, a general expression from the members of this Society, of how these questions have affected them in their practice.

We have members whose special line of work comes under some one of the divisions I have made, and who must have very decided opinions in regard to the duties and obligations of engineers whose work would be classed under some other division than that in which they themselves are placed.

I am fully alive to the danger incurred in treating this subject, and I shall be careful to avoid any expression that might tend to wound any of those whose friendship I hold in the highest esteem. So, if I do say anything that hurts, let it be understood that the reference is not to the practice of any local engineer, but to some bad practices I have read about as being done in the East and in Europe.

Naturally, and by preference, due to my limited knowledge, my remarks will have special reference to mechanical engineering. Other members, skilled in the practices of the civil branch of our profession, will, I trust, take up these questions and tell us how things are done in the various relationships in which civil engineers stand to each other and to their clients.

As I will confine my remarks to what I have observed in connection with my own experience, my task will be an easier one than if I had to look up the statements of others and find authority for accepting them myself or for presenting them to you as truth.

I have placed the consulting engineer in the first division of this subject, because I think the position he occupies, or should occupy, is of the first importance. Great interests, affecting not only his clients, but, it may be, the welfare of a whole community, often depend upon his judgment.

In the mechanical branch of the profession there are not many consulting engineers that meet my idea of the requirements of that position. Standing, as he does, as a judge between the individual or the corporation who provides the means to carry out an enterprise, and the other individual or corporation, who, for the money expended, is to produce the plant required for the purposes of such enterprises, he must, in order to be successful, possess complete and accurate knowledge not only of the things required, but also of the capacity and ability of the men that are to produce these things.

A consulting engineer, if he has the full confidence of his client, gives advice, not only as to the materials which his client needs for the purpose he has in view, but also as to whom he should employ to produce these things. This is the most difficult duty required of the consulting engineer, and the one that gives him most trouble; for, amongst

all the contracting engineers that are desirous of having his client for a customer, only one will approve of his advice; all the others will accuse him of ignorance, and some of them, may be, of something else. It is, therefore, of the first importance that the consulting engineer should possess a most complete and accurate knowledge of the latest and best practice in regard to all the matters on which he is consulted.

Some engineers are honest and will not pretend to give advice unless they are conscious of their ability to give their client the very best thing possible for the purpose in view. Others are simply after the consulting fee, and run around amongst the manufacturing engineers, getting this one's idea and that one's idea, and out of these patching up a sort of specification that the client accepts as his engineer's requirements for the work on hand, while, if he had gone direct to any one of the sources where his engineer got his information, he would have got a specification that at least one man could give a fair bid on.

This kind of consulting engineer has of late fallen into a trick of protecting himself by specifying that the work he is supposed to have planned out and carefully described, is to perform certain functions under certain conditions, and with a certain minimum economy, and the hapless contractor is required to guarantee that the result will be at least equal to that specified.

If the consulting engineer is competent to do what he has undertaken, he will also have confidence enough in his own work to be able to assure his employer that the result expected will be obtained without placing a third party in a false position.

In other words, why should the engineer's client ask a contractor to insure him against any mistake he may have made in employing the wrong man as a consulting engineer?

It appears to me that, as things are now, there is a grand opportunity for an Engineering Insurance Company which would employ the best talent in each line of work, and to which capitalists would submit plans and specifications prepared by their consulting engineer; and, should the Insurance Company's experts approve the plans, they would be accepted as a reasonable risk and the result insured in a sum equal to the cost thereof, at a reasonable premium.

This practice on the part of consulting engineers, of requiring a contractor to guarantee that their design will accomplish all that they have promised their client, has become so much a matter of course that we are never surprised even at the most childish expression of it in a specification.

Looking over a contract and specification for barges, drawn up by the consulting engineer for a Russian company, the other day, I found the following:

After giving plans and dimensions for the barges and specifying the weight of material, the engineer requires the contractor to guarantee that the said barges will carry 500 tons on 3 feet 6 inches of fresh water.

Now, to his employers, this engineer appears to be protecting their interests, but if he had specified something to be 10 feet long, and then required the contractor to guarantee that it would be 120 inches long, they would have thought him rather too childish for a consulting engineer.

There are, however, some notable exceptions to this type of consulting engineer. Some two weeks ago I had to estimate the cost of large pumping works designed by Mr. E. D. Leavitt, of Cambridgeport, Mass. The drawings were very complete in every detail, clearly figured out and so indexed for reference that the work of estimating was a pleasure. The specification was brief, and stated distinctly the point of beginning and the point of ending of the proposed work, and what was meant by the words used in the drawings. The contractor was held responsible for the quality of material used and of work done thereon. But he was not asked to guarantee that Mr. Leavitt's design of engine would successfully accomplish the results that he had promised. In fact, the economic result expected of this design was a matter that lay entirely between the water board of the city and their consulting engineer, and with which the contractor had nothing to do. In this respect Mr. Leavitt sets a good example to the consulting engineers of the country, and his reputation is largely due to the fact that nothing leaves his office until it is thoroughly worked out, and no outsider is asked to take the responsibility of any design bearing the name of E. D. Leavitt.

This is the position I would like to see all consulting engineers take in regard to their work. It would add to the dignity of the profession. The client would be more careful as to whom he employed as engineer adviser. The contractors would not be tempted into promising impossibilities, and in the end resorting to trickery to hoodwink an incompetent engineer into believing that the impossible had been realized, at least in this one case.

If my friend, the consulting engineer, will pardon my boldness, I will say to him, be sure of your ability and experience to plan the very best thing to fulfill the conditions of the problems you are to solve. Then go ahead, but don't ask a contractor to guarantee that you have not made a mistake.

The inspecting engineer may be either the consulting engineer himself, or his representative, or he may be an independent engineer employed directly by the principal party to the contract.

His duties are the same in either case, and consist in seeing that all the obligations under which the contract and specification place the contractor are faithfully fulfilled.

The inspecting engineer should have an accurate knowledge of all the detail of the work he is to inspect; should know the condition under which each part of the work operates when performing the functions for which it was designed; besides, he should have a good knowledge of men and of their weaknesses, and above all he should have a good temper and a tender heart, for while he is expected to do justice, he should also love mercy.

Much of the trouble that often occurs between inspecting engineers and contractors is caused by improperly written specifications.

I sometimes think that specifications are written for the express purpose of preventing the contractor from building the work specified without evading the provisions of the specifications or coaxing the inspector to read them through his spectacles.

Why should a specification say that the material used should be the very best possible of its kind, when, of any two pieces of material taken at random, one will be better than the other, which would mean, by the language of the specification, that one shall be taken and the other shall be left. Why should castings be specified to be free from all defects, shrinkages, scales or scabs, when such a thing is the exception and not the rule. Why specify workmanship to be perfect, where there is no such thing as perfect workmanship.

I am in the habit of writing specifications in the following way: The materials used shall be reasonably good, and fit for the purpose for which they are to be used. Castings are to be good and sound, and reasonably free from defects that would affect their strength or sightliness. The workmanship is to be good, and of the character required for each part of the work. This is usually scratched out as not likely to produce the best result, and the usual absolute perfection is inserted, and coupled with another requirement, that the whole work must be done to the entire satisfaction of the inspecting engineer. This word, satisfaction, is a mistake, for an engineer may not be, and very often is not satisfied with work, when done according to the specifications and contract.

I once had to do work under an inspecting engineer, who claimed that the clause requiring that the work must be done to his entire satisfaction meant that the work should be done over and over again until he was entirely satisfied; and when I required him to state what would satisfy him, he claimed that the specifications did not require him to instruct us what to do, but simply to say whether he was satisfied with it when done. He claimed, in effect, that, whatever his whim, caprice or notion required in order to be satisfied, we must meet the demand, for we had contracted to do this work to his satisfaction.

My idea of an inspecting engineer is, that he should be a consulting engineer to the contractor. It is unfortunate when inspectors are suspicious of the contractor, and the contractor is afraid to show to the inspector any little defect that he discovers. There should be mutual trust and confidence between them. A contractor should never ask an inspector to look at anything that he himself, if inspector, would condemn; but, if he has any work on hand wherein there has been developed some slight imperfection in material, or where some workman has made a mistake, so that the finished work will not be strictly according to the specifications, but quite good enough for the purpose for which it is to be used, he should be able to show it all to the inspector, confident that no advantage will be taken of his honesty. How often a contractor is driven, through fear of losing good property, owing to lack of confidence, to run the risk of an inspector failing to find out the defect in material, or error in workmanship. Inspectors expect this course to be taken, and are slow to admit the possibility of an honest contractor. I have often asked inspectors to come and look at work that was not just as it ought to be, and yet altogether too good to condemn, and found that the fact of my pointing out the defect was enough to condemn the work.

One inspector used to tell me that he could not conceive of my calling his attention to work that I thought was good enough, and that

my coming to him was, to his mind, an evidence that I did not want the work to pass, but that I wanted his assistance to condemn it. My experience is, that to call an inspector's attention to a fault, however slight, is to have the work condemned.

This is not the result of want of knowledge on the part of inspecting engineers, but is due rather to a misunderstanding between the parties in interest as to their relationship to each other. There should be full confidence between contractors and inspectors. Any defect, however slight, should be accepted, if at all, with the full knowledge of the inspector. The inspector should take into account all the difficulties that beset the contractor. Some inspectors appear to think that they are expected to earn their remuneration by making the work more costly to the contractor.

An old engine builder, on the water front here, said that he made a contract to build a set of machinery for a heavy tow boat, and "I was dead sure," said he, "at the beginning, to clear $5,000 on the job, but they hired a man to prevent me from making that $5,000, and he was a splendid success; for, before the job was finished, the sheriff had my shop, and even he could not satisfy the inspector." Inspectors are not all of this type, however, and the better fitted they are for the responsible position they hold, the more pleasant the relationship will be between them and the contractor.

During the past six years or so I have had much to do with Government inspectors, and I had often been told how hard it was to get along with them; that nothing would satisfy their critical methods of inspection; and yet I have found the Government inspector not only a gentleman in the highest and best sense of the term, but also a great help in meeting the requirements of the contract. I have always felt perfectly safe in giving them full information in regard to all material and work, and have always found them ready to take a reasonable and practical view of the case. I am happy to be able to give this testimony and am proud of the professional staff that have represented the Government from time to time at our works.

In regard to the contracting engineer, I cannot speak so freely as I have done of the others. I belong to that class myself, and it is very difficult to see ourselves as others see us. Yet we are conscious of great room for improvement in our methods of doing work, as well as in our relationship to the other two classes of engineers and to our patrons. Keen business competition makes the battle a hard one for the honest contracting engineer. Sometimes it would appear that the old road that leads to success, that of honesty and skill, combined with great pride in the character of the work turned out by his establishment, is no longer open to the contracting engineer. He must now aim at the greatest apparent result for the least cost. Each one tries to promise something more than his competitor, and the one that tells the best story, rather than the one who has the best skill, is apt to be entrusted with the work for which they are competing.

Change now seems to be written on every product of engineering skill. Work involving much thought and experience in its production is discarded for something else before it has had time to earn a reputation for the engineer that produced it.

In our time, business reputation depends not so much on what we have done as on what we propose to do next. Yet I am not ready to accept this condition as either permanent or true. And I would say to my brother engineers that I am more and more convinced that there is no near cut to engineering reputation, however much the rapid changes now going on in engineering practice may tend to deceive us into such belief. To reach a permanent reputation for great skill in any one line of engineering, our life must go into it, trudging along the old well-beaten track of honest, steady and intelligent effort. The value of what we produce should be measured, not by what we got out of it in the shape of profit or present notoriety, but by what we put into it of honest skill and ripe experience.

In the efforts now being made to draw trade to our State, let us avoid the miserable scramble after the cheap and temporary, for no lasting prosperity or individual reputation can be sustained on such a foundation. Let our aim be to produce the very best within the compass of our skill and then produce that thing, but no other, as cheap as possible.

Between consulting and contracting engineers there is not that desire for mutual helpfulness that there ought to be. The contractor is often ambitious to be the consulting engineer, and, in some cases where his experience gives him special fitness for this position, it is quite right that he should be so, and no antagonism should result from such practice. In certain branches of engineering, the contractor must maintain a large staff of skilled engineers at his works, and he is thus in a position to bring to bear on the problems an accumulation of skill and experience that no consulting engineer could match; but a contractor should be in such a position before he undertakes to come in between the consulting engineer and his client.

The position of the consulting engineer in California will, I think, improve. Capital is being more and more invested through corporations, and the consulting engineer must find his proper place as the technical adviser of such corporations.

We need a better understanding between the various branches of our profession. We must have a high standard set up for engineers to reach before being considered competent to give advice in regard to great engineering enterprises, or to inspect the work in progress. Nor should that standard be lower for the contracting engineer, who guides the skill which produces the results promised by the consulting engineer and satisfies the keen eye of the inspecting engineer who represents the interests of those who provide the needful.

An Improved Method of Descurfing Retorts.

[A paper read by Mr. S. S. Mellor, of Northwich, before the Manchester District Institution of Gas Engineers.]

The removal of deposited carbon from retorts is one of the difficulties which trouble the manager of a gas works during the busy winter season. No one as yet has succeeded in preventing the formation of this deposit. We all know that high temperatures and the hydraulic seal, with its pulsations, soon cause a carbonaceous coating, with its attendant disadvantages of smaller retort space and increase of fuel account, owing to the thickness of non-conducting substance between the retort and the charge of coal. Even when we have conditions most favorable to the non deposition of carbon, the deposition still occurs, and the necessity for its removal still remains.

The result of the making up of the retorts is in some cases deplorable. In taking down settings in many places, thick blocks of carbon are not infrequently met with. Depositions of carbon inches thick and the full length of the retort are not uncommon, resulting in a very serious loss in working results. Almost every manager must occasionally drop the working of the settings, in order to burn off the carbon or scurf, and finish the process by the use of bars to detach what remains after several hours' loss of time. The retorts, after this treatment, are more or less leaky; they require patching, and are not up to standard work for a day or two.

This process of getting rid of the carbon is troublesome, and several other methods have been suggested for effecting its removal. One of the earliest of these was the employment of a steam jet, inducing a current of air into the retort, and causing a more rapid combustion of the scurf. Almost invariably this brings down the heat of the retort, and from this cause the process is little used. Another plan suggested is the use of water spraying at the end of a hollow bar, which is sharpened to remove the carbon.

Failures in this and other directions led to the adoption at the Longport gas works of another method, which gives complete satisfaction, and is applicable to any works, large or small. At these works, an old exhauster of 20,000 cubic feet per hour capacity has been placed in a building adjoining the retort house, and it is connected by belting to an engine that works the coke crusher. The inlet of the exhauster is protected by a finely perforated zinc hood, to prevent admission of dirt or grit. The outlet is connected to a 6 inch air main. This is taken to the retort house, up the side of the retort house wall, and along the top of the benches, just behind the ascension pipes.

From this main, branches of 3-inch wrought tube are brought down by the side of each setting of retorts, and fitted with 3-inch by 2½-inch tees, which are placed a little under the level of each tier of retorts. These tees are closed with plugs. Whenever any particular retort is to be cleaned, the plug is removed and a nipple inserted, one end of which is tapered so as to enable the coupler of another tube to slip easily on it. The exhauster is put to work, and a blast of 20 inches water pressure is obtained. By means of two bends and a length of pipe, the blast is sent into the retort after the withdrawal of a burnt-off charge. (I may say, in passing, that the retorts chiefly experimented upon have been single; the through retorts at Longport having been stopped in the middle for convenience of working.)

The air pipe is placed 2 or 3 feet within the mouthpiece, and the blast is sufficiently forcible to sweep the whole length of the retort, impinge on the back, and return along the top and upper sides. Carbon is immediately sent out in a shower of flakes and sparks, and in 20 minutes is ready for the bar for detaching. Some 2 cwts. of carbon have been detached from a retort in 35 minutes, the retort being left perfectly clean and ready for recharging. This is the accumulation of two

months' working. It is advisable to use the blast more frequently, as by so doing the use of the bar is altogether dispensed with, which is far preferable. A week's deposit can be removed in 15 minutes, a fortnight's in about 30 minutes, and three weeks' in about an hour—leaving the retort perfectly clean, and without the admission of any tool for detaching the carbon.

The above process applies to closed retorts. For through retorts a different method is adopted. The air pipe in this case is almost closed at the end, and the air issues from a row of holes on each side and extending 3 or 4 feet along the side of the tube. The blast cuts into the carbon laterally. When the first half of the retort is cleaned an additional length of pipe is screwed on, and the remainder of the retort is cleaned in the same manner.

Since the adoption of this plan there has not been any trouble with retort carbon. For more than 12 months a charge has not been missed through the de-scurfing of the retorts. As the retorts are worked six-hour charges, it is only necessary to draw a retort half-an-hour before the usual time, put the apparatus to work, clear the retort, and it is ready in an hour for another charge. The process, instead of cooling the retort, leaves it as hot as, or hotter than, at the commencement of the blast; the 5½ hours remaining are quite sufficient for the burning off of a complete charge. The results have been a continuous make of from 8,000 to 9,000 cubic feet per mouthpiece every 24 hours for months together. There has not been time enough yet to see how much the life of the retorts has been lengthened; but there is not a doubt that the abolition of the bar in scurfing will considerably lengthen the period in which a retort can be worked with advantage.

[Mr. Mellor added that he had had no practical experience of the apparatus he had described. The matter was brought to his notice, and he visited the works at Longport, where Mr. Peaty had had the apparatus in use for some time. He saw it at work, and could testify that it answered most admirably. He saw a retort with quite 3 inches of carbon on it, that had accumulated during six weeks, and in less than an hour the whole of the carbon was taken off and the retort recharged again.]

Discussion.

Mr. W. W. Hutchinson said it had often occurred to him that, as Mr. Mellor pointed out, the pulsation of the hydraulic seal was the cause of a good deal of the deposition of carbon in the retorts, and he would like to have the benefit of the observations on that point of some one who had used both sealed and unsealed retorts. In regard to the de-scurfing, it had hitherto been done, as far as he was aware, by a de-scurfing bar which had its handiness to recommend it. As far as the results stated by Mr. Mellor were concerned they were satisfactory, but the appliance appeared to be a little bit cumbrous. Might not a flexible tube carried to the point of attack be a little more useful?

Mr. R. G. Shadbolt said he regarded the paper as very much to the point. Every gas manager was anxious to do what he could to extend the life of his retorts. He thought that no part of the plant of a gas works was more badly handled than the retorts under the orthodox method of removing the scurf. But was not the method now described rather cumbrous, as Mr. Hutchinson had said? A 20,000 cubic feet exhauster seemed rather a big thing for such a purpose. Would not a light cheap fan be almost equal to the work?

Mr. S. Meunier said that as one of the few who had seen the process at work at Longport he could confirm Mr. Mellor's statements as to the results, which had certainly been very remarkable. The scurf was got off very quickly, and there was no diminution of the heat. At the same time it did appear to him to be a little cumbrous, and on going into the question of cost he found that the capital outlay was also very heavy. The question was whether the saving in the life of the retorts and the greater ease of doing the work sufficed to make the system worth the money. He had not quite made up his mind on that point. The doubt as to whether the apparatus was worth the money was specially great in connection with a works like his own, where they did not make more than 15 tons of carbon a year, if as much as that. Apart from the question of whether it would pay to put it down, the apparatus was certainly one of the most feasible things he had seen.

Mr. Isaac Carr said he did not quite understand the references in the paper to the periods at which the carbon should be removed from the retorts and the time it took to remove it. He had yet to learn that there was any fixed rule as to the time carbon took to deposit on the retorts; if they compared their experiences as to the time at which scurfing had to be done, they would probably find that no two works were exactly the same. It was also a fact that some works were little troubled with carbon, while others were troubled a great deal.

Mr. Mellor said he thought Mr. Carr would find, on turning to the paper, that the reference was to the Longport works, not to gas works generally.

Mr. Carr thanked Mr. Mellor for pointing this out, but said that even if that were so he considered the statement too vague, because it did not give the thickness of the carbon that was formed at the Longport works in the time stated. With regard to the introduction of machinery into the retort house, it was suggested in the paper that an exhauster should be used. Mr. Shadbolt had asked whether a fan would not equally answer the purpose. He thought both were objectionable. He should like to know whether the object in view could not be accomplished by an air blast induced by a steam injector.

Mr. Geo. Niven said the apparatus which had been described seemed to him too costly and cumbrous to make its adoption advisable. During a visit he had the pleasure of paying recently to Waltham Cross, to see the system of scoop charging there—a system he was about to introduce into his own works—he saw apparatus employed for de-scurfing which was on the lines suggested by his friend Mr. Carr. He presumed, of course, that Mr. Carr meant that not only the amount of oxygen required should be got by the introduction of the steam jet, but that they should very nearly, if not altogether, approach the oxyhydrogen blowpipe. It was necessary, of course, to have intensity of heat together with an excess of oxygen to bring about the destruction of the carbon on the retort. He was much pleased to see the manipulation of the simple apparatus at Waltham Cross, and he was satisfied it was a thing that might very readily be introduced into any retort house with very much profit and a saving of time and labor to the men.

Mr. J. Wilkinson asked whether it was desirable to allow a single retort to go until 6 inches of carbon had accumulated on it. If they took a retort of 24 inches, the presence of such a coating of carbon would mean that the retort was being worked at three-fourths of its maximum capacity. It was surely bad policy to go on working in that way for the sake of not missing a single charge.

Mr. W. H. Burtonshaw said his father, some years ago, adopted a plan of removing the scurf which he thought was a very sensible and practical one. One day per month he would lay off a certain number of retorts, and taking off the dip and the H-pipes, he would revivify the spent lime by means of those retorts. By that means he would in a very short time succeed in clearing the retorts of their carbonaceous deposit.

Mr. H. Peaty, Longport, replying to some of the points raised in the discussion, said the apparatus had been declared to be cumbrous. He confessed that he would not have put it up himself if he could have found any other equally effective remedy. If he had had electricity works close to the works and could have had a dynamo with portable fan attached, to place in front of the retorts, there would have been no need of exhauster, etc. A small dynamo and fan applied direct would be worth trying where they were available. The steam injector suggested by Mr. Carr, used as a means of getting up air pressure, might be tried as an alternative to the exhauster. The steam jet used at Waltham Cross he had not seen, and did not know how it worked; but he should doubt whether it would do the work as quickly as a direct air blast. The introduction of steam invariably brought down the temperature of the retort, and had never been satisfactory to himself. The 6 inches deposit of carbon was alluded to by another speaker, and, of course, it was known that it was a bad thing. It was 3 inches of carbon on each side, and carbon, as they knew, distributed very unequally. The last speaker suggested another method, but it was not a method that would be of any use to people who did not regenerate their spent lime. The chief objection to the new method appeared to be that it was heavy and cumbrous, but he certainly would not go back on the method until he could find a better. Meanwhile he would do his best to make the apparatus a little lighter.

Mr. Carr inquired what was meant by a week's deposit of carbon.

Mr. Peaty said he thought it would mean about a quarter of an inch, or, where the carbon was a little more flaky, it might be even thicker than that.

Mr. Mellor added, with regard to the deposit of carbon varying in different works, that there could be no doubt that that was so to a very great extent. He thought the deposit was due in great measure to excessive seal in the hydraulic main, and to the coal, to some extent. He had had experience of different seals of within the last two years. He built a new retort house last year, and he had only needed to scurf the retorts in it once in twelve months, whereas in the old house he had to do it three or four times in the winter; that was due to the difference in seal in the two houses. As to the use of a steam injector, to inject air, about a dozen years ago he made a small steam injector himself out of a piece of wrought iron pipe, but he could

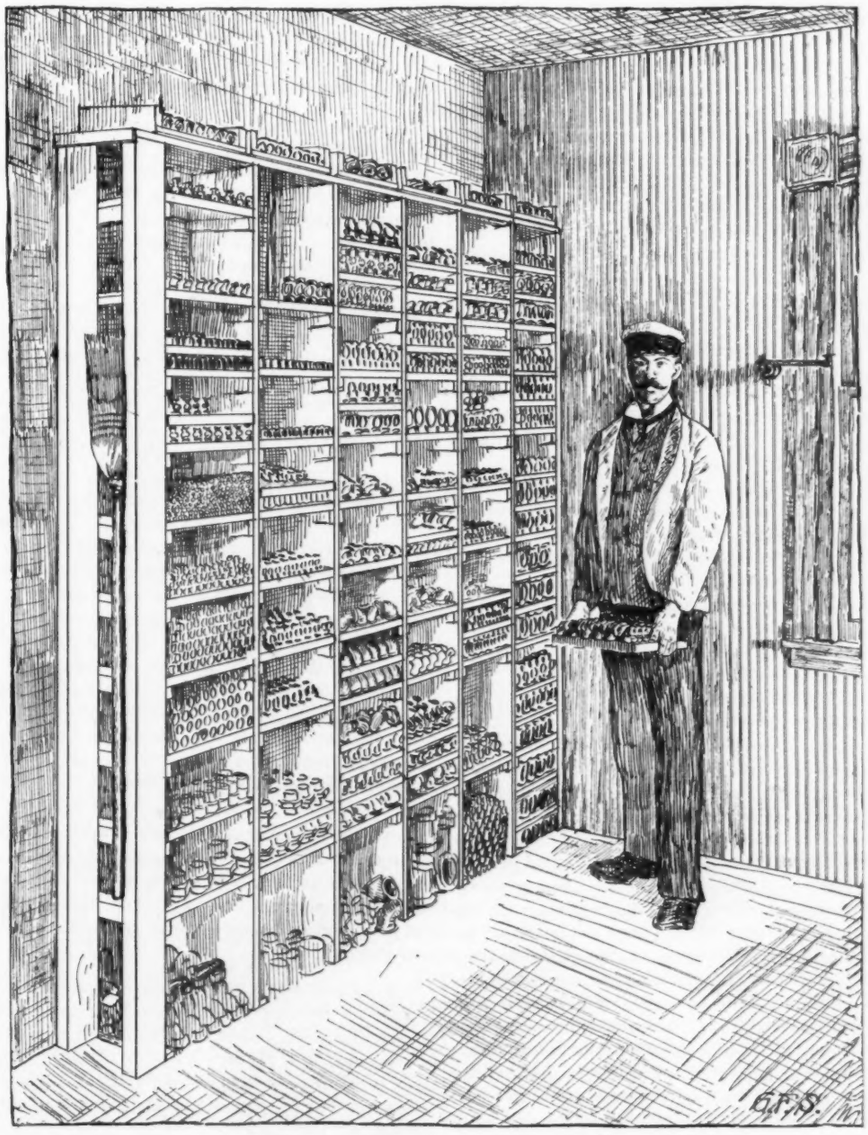
never get the de-scurfing done under 4 or 5 hours, and the temperature was so much reduced that he went back to the bar scurfing.

Mr. Niven said he ought perhaps to explain that the steam jet used at Waltham Cross for forcing the air into the retort was at the inlet end of the tube through which the air and steam passed, so that the heat generated in the tube dried the steam, and by that means any diminution of the heat in the retort was prevented.

A Fittings Rack for a Small Works.

Designed for the JOURNAL, by MR. GEO. F. SUMMERS, M.E.

The accompanying illustration is made from ideas obtained in a conversation with Mr. E. H. Williams, of Waterbury, Conn., some six years ago, and is drawn to meet the following requirements:



1. The fittings must be in sight, to enable the picking out of the desired article quickly.

2. The fittings must be stored in a regular, orderly manner, to have a good moral effect upon the men, influencing them to take care of their material.

3. The fittings must be stored carefully to prevent the threads being damaged, and, in consequence, imperfect joints.

4. The fittings must be stored compactly.

5. For taking account of stock, the fittings must be arranged so they can be counted in blocks of 50 or 60 at a time, to save labor and prevent damage to fittings by handling.

The cut shows a rack that would have a capacity of 180 three-quarter e'ls, and other fittings in proportion. The material for this rack would cost $6.

Solubility of Lead in Ammonia.

[By MR. H. ENDEMANN, in *Am. Chem. Jour.*]

Some years ago my attention was forcibly drawn to the possibility that the ammonia of commerce may contain lead. Quantitative determinations of traces of lead in an organic acid were made in my laboratory, and in a Western laboratory, and gave results which were low here and high in the West. My method consisted in incinerating the acid and determining the lead in the ash. The Western method consisted in neutralizing the acid by ammonia, then adding ammonium sulphide, and separating and determining the lead in the precipitate thus obtained. The Western method gave in my hands practically the same result as my incineration method. Meanwhile, the high results continued in the West.

Inasmuch as the only reagent used in large quantity in the saturation method was ammonia, I concluded that, notwithstanding the fact that no mention had been made and published, embodying such observation, ammonia must be capable of dissolving lead in the presence of air. An experiment proved this to be correct.

The lead found in the organic acid by this method was, therefore, in part derived from the ammonia used in the analysis. Hence the difference between the results was explained.

Since, I have repeatedly had occasion to revert to this fact in one

form or another, and have been unable to find any satisfactory explanation in the literature bearing upon this subject, I have finally concluded to publish my results.

In the literature but few statements can be found bearing upon the solubility of lead oxide on ammonia. The oldest statement is by Karsten, who says that lead dissolves in ammonia, forming a dark yellow solution.

The last mention is found in the *Comptes Rendus* for 1846, wherein Calvert doubts the existence of an amide of lead. Later publications are all to the effect that lead oxide is insoluble in ammonia. In all books on analytical chemistry, the statement occurs that lead salts are precipitated by ammonia "insoluble in excess."

I, myself, could not get the yellow solution of which Karsten speaks, by using litharge and the strongest ammonia in the cold, and allowing the action to proceed for weeks. I obtained no trace of lead in solution. The ammonia contained, however, some zinc, which must have been an impurity of the litharge.

If lead is immersed in the strongest ammonia (29 per cent.), there is within the first day or so, apparently no change. The ammonia remains perfectly clear and the lead shows no changes. If, however, the ammonia is tested for lead it will be found to contain quite a quantity. On allowing to stand for some time longer, the ammonia solution still remains clear, but the lead will be found coated with a colored substance. This coating is at first orange, later decidedly rust-colored as long as it remains in contact with the lead. The dark color of the coating fades quickly after the precipitate has been mechanically loosened from the metal.

After three days' action the ammonia solution contains 0.0139 per cent. lead, or 13.9 parts in 100,000 parts. The coating removed from the sheet lead by a quick action of dilute acid, contained 0.0569 gram of lead. By allowing the action to proceed for weeks, a white precipitate is formed upon the bottom and sides of the vessel, which appears to be mainly lead hydroxide, mixed with oxides of other metals. Of ammonia, it contains only 0.15 per cent. after drying. During this long standing the ammonia had gradually become less concentrated.

If in the place of 29 per cent. ammonia, 2 9 per cent. ammonia water is taken, the oxidation of the lead is quite as lively, but the appearances differ. In 24 hours a white precipitate is visible upon the glass, the surface of the liquid, and upon the lead, which greatly increases during the next 48 hours.

The lead is partly in solution, but present mostly as precipitate. The lead in both forms together in 100 cc. of such ammonia, amounted to 0.0922 gram, or 92.2 parts for 100,000 parts of the liquid. The precipitate is also in this case apparently the hydrated oxide of lead.

The rapidity of oxidation is evidently not due to the greater or less amount of ammonia present in the experiment. In the experiment with the weaker ammonia the oxidation has even been more rapid. Whether this is due to a slightly greater surface of the lead sheets used, or to the fact that the stronger ammonia excludes the air from the flasks and thus impedes oxidation, I have not attempted to decide. All observations tend to point to a suboxide of lead as the body soluble in ammonia; for instance, the fact that the clear solution of lead in concentrated ammonia becomes turbid on exposure to air. These observations are of considerable practical utility. In the first place, in the manufacture of ammonia water, lead linings and connections for absorption tanks should be omitted. Some such use evidently laid the foundation for my own observations. But its main importance is derived from the possible contamination of waters which have been softened by the addition of lime water. It is a well-known fact that waters which contain bicarbonate of lime act hardly, or not at all, upon lead. To this observation may be added my own, that bicarbonate of ammonia likewise does not act upon lead. If water containing bicarbonate of lime and ammonia is softened with quicklime, the danger of destroying lead pipes becomes at once evident, if we consider that thereby the formation of some free ammonia may be caused. I should mention, however, that caustic lime is about as dangerous as ammonia. Lead dissolves quite easily in lime water in the presence of air. Therefore, even in the absence of ammonia salts, lead may be destroyed, if proper care is not taken that the lime shall at no time be in excess.

Rain waters, which do not contain any quantity of fixed bases, but mainly ammonia salts, may at any time by loss of acid as, for instance, reduction of nitric and nitrous acid by reason of putrefaction, contain free ammonia, and then become destructive to lead while they themselves become contaminated.

In the literature we quite frequently find examples in which water apparently did not act upon lead accorded to the accepted notions, and in such cases it might be worth while to consider the bearings of the above facts for a probable explanation of such anomalies.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

MR. A. W. EBLING, Secretary of the Otto Gas Engine Works, Philadelphia, reports that overtime is the rule now with their factory hands. An important installation recently made by the Otto folks was that at Sisterville, Va., where two 110-horse power engines were placed in the power house of the Sisterville electric lighting works.

THE JOURNAL for December 6th contained a very readable article, entitled "Defects in Electrical Specialty Designing," prepared by Mr. N. H. Gardner. Through error (an inadvertent one, however), the article was credited to the *Electrical World*, whereas the credit should have been given for it to the *Electrical Engineer*.

THE amended schedule of the Framingham Gas, Fuel and Power Company, of South Framingham, Mass., which took effect on the 1st inst., is as follows: For lighting use, $2 per 1,000 cubic feet, less 10 per cent. for prompt payment—on or before the 15th day of the month; for cooking and heating use, 25 per cent. off; for power use, 37½ per cent. off.

A CORRESPONDENT is informed that no opposition was offered before the Board of Gas and Electric Light Commissioners, of Massachusetts, when that body considered the application of the proprietors of the Somerville Gas and Electric Company for authority to issue $100,000, the proceeds of which issue were to be applied to the effacement of the Company's floating debt.

THE Parsons (Kas.) Light and Heat Company has put the selling rate at $1 per 1,000 cubic feet, which low price is chargeable to the brisk competition existing between it and the local natural gas concern.

THE Pacific Acetylene Gas Company, of San Francisco, Cal., has been organized by Messrs. R. E. Wood, A. E. Mood, H. W. Higgins, P. W. Rochester and Frank Faxon. It is capitalized in $100,000.

LAST week we noted that the Common Council, of Mount Vernon, N. Y., at the instance of Alderman Ultcht, had adopted a resolution authorizing the Committee on Street Lighting to have the gas supplied by the Eastchester Gas Company tested, to determine whether the quality of the gas was up to the standard, etc. Subsequently, Mayor Fiske made some inquiry as to the probable cost of making such a test, the result of his study being the knowledge that an analysis of the nature suggested would involve an expenditure somewhere between $500 and $2,000. At the next meeting of the Council the Mayor expressed his belief that even the minimum expenditure would not be warranted, considering the knowledge they would have in hand after the experts' report had been received. As a result of the Mayor's expressions the resolution to "investigate" the gas was rescinded.

MANAGER E. G. PRATT, of the Capital City Gas Company, of Des Moines, Iowa, invites every gas man to visit the Company's handsome new office quarters, Nos. 413 and 415 Locust street. The display of improved appliances for using gas, because of effective arrangement and good and varied assortment, attracts many visitors to Mr. Pratt's headquarters.

PAPERS announcing the incorporation of the Montgomery County (Pa.) Gas Company were filed in Norristown, Pa., on the 10th inst., by Messrs. John W. Baker, of Philadelphia; John J. White, of Lansdowne, Pa., and Henry C. Paul, of Germantown, Pa. The capital stock is returned at $100,000, and Henry C. Paul is the Treasurer of the concern. The purpose of the Company is to compete with the present Norristown Gas Company.

THE proprietors of the Carthage (Mo.) Gas Company and of the Carthage Incandescent Light Company have completed an amalgamation of interests. The title of the combined enterprise is, the Carthage Light Company, and its officers are: President, George M. Myers; Vice-President, E. B. Jacobs; Secretary, John Moore; Treasurer, L. K. Taylor.

AT the annual meeting of the Riverside (Cal.) Gas and Electric Light Company the officers elected were: Directors, W. A. Hayt, C. P. Hayt, J. H. D. Cox, A. A. Caldwell and B. F. Burt; President, W. A. Hayt; Vice-President, J. H. D. Cox; Secretary and Treasurer, B. F. Burt; Superintendent, A. L. Rice. The annual reports showed a most satisfactory increase in business.

THE proprietors of the Plainfield (N. J.) Gas and Electric Light Company have re arranged their selling schedule. Hitherto the rate for illuminating was $2 per 1,000 cubic feet, less 10 per cent. for prompt payment; hereafter the gross rate is to rule at $1.80 per 1,000 cubic feet, less 10 cents per 1,000 on accounts settled within 10 days.

THE Common Council of Hampton, Va., has authorized Mr. Samuel P. Regester and associates to construct and operate a gas works in the place named. Under the agreement the city is to receive $5,000 of the Company's stock for the right to open the streets, and the life of the franchise is put at 26 years. Mr. Regester is interested largely in the new Company at Newport News, the plant at which point is now under construction. For the benefit of those who did not attend the last meeting of the American Gas Light Association, it may be in order to say that Hampton, which is the capital of Elizabeth City county, Va., is on the north side of Hampton Roads, at a point on the mouth of the James river 15 miles north-northwest of Norfolk and 2 miles west of Fort Monroe. Old Point Comfort is included in its territory, and it also holds the world-famed school for colored people, known as the Hampton Normal Institute. It has some manufactures, notably of plows and building material, and its population does not exceed 3,500.

THE last semi-annual dividend of the Western Gas Company, of Milwaukee, Wis., is at the rate of 6 per cent. per annum. The dividend (3 per cent.) is payable January 20.

THE proprietors of the Macomb (Ills.) Gas and Electric Light Company have certified to an increase in the Company's capital stock, from $25,000 to $50,000.

MR. WM. J. HOUGH has been appointed Superintendent of the San Leandro (Cal.) Gas and Electric Light Company.

THE Foulis hydraulic discharging machines, installed in Station No. 2 of the Cleveland (Ohio) Gas Light and Coke Company, are working to the complete satisfaction of Superintendent Christie. The machines are operated on 26 benches of 9's, fired by means of full depth regenerative settings of the Kloenne-Bredel type.

ANOTHER thing that might be noted in connection with the gas business in Cleveland is that the Company over which Mr. Greenough presides has put down about 30 miles of mains this year, the diameters ranging between 4 inches and 10 inches. The output of the Company has increased almost 20 per cent. in 1897, as compared with that for 1896. The output of the Peoples Gas Light Company (which supplies the west section of the city) also shows a substantial gain.

MAYOR WURSTER, of Brooklyn, N. Y., has vetoed the grant made by the Board of Aldermen authorizing the Flatbush Gas Company to extend its system to all parts of the city of Brooklyn.

THE Pittsfield (Mass.) Company, according to the official returns of the State Gas Inspector, is sending out a gas well above 30 candles in illuminating value.

WE understand that the natural gas plant of the city of Tiffin, Ohio, has been sold to Messrs. Moffett & Whitney, at their bid of $88,139.50.

THE Philadelphia *Ledger*, in referring to certain practical reforms that are being instituted by the United Gas Improvement Company in connection with the taking over by the latter of the city gas works, has this to say: "There has been some perturbation among the clerks and inspectors of the gas offices over expected changes, it being the supposition that the new managers of the business will get along with fewer men than the city did. The inspectors have already been given a taste of the new methods, an order having been issued that the inspectors who take the statements of the meters in the residences or places of business of consumers shall be expected to take the statements of not less than 200 meters as a day's work, a task that some of them are disposed to regard as impossible. Those who are often in the vicinity of Juniper and Filbert streets can readily understand the reason why. It has been a habit for the inspectors to get out on their rounds about 8:30 or 9 o'clock in the morning, and to get back about noon or a little later, taking anywhere from 50 to 80 statements during the day. There are in the city 172,000 meters, and 70 inspectors. Meters in private houses are inspected quarterly, and those in business houses monthly or weekly, depending upon the quantity of gas used. One of the inspectors argued that the Company is setting an almost impossible task, and that it would require a man to work from 7 o'clock in the morning until 6 o'clock in the evening to take statements from 200 meters. In this view of the case he was confirmed by another inspector, who said: 'Just think of the number of times you must wait 5 minutes for some one to answer your ring at the door. Very often you have to find your way through a very dark cellar and maybe crawl over a coal pile to get at the meter. This is no uncommon thing, and 10 minutes would be none too much to allow for taking a statement.' A gentleman connected with the Gas Company, to whom these arguments were stated, smiled, and replied: 'That's all right. We have been in this business for some time, and I don't think our men will have any trouble in averaging 200 statements a day. It is done in other towns, and, what is more, there are men on the force who have taken 300 in a day, and that without working from 7 o'clock in the morning to 6 in the evening. The hours of work are to be from 8 A.M. to 4 P.M., for clerks as well as inspectors.' It is understood that the difficulty that has been found in nearly all directions in the Gas Bureau service to find work enough to keep everybody employed from day to day is to be remedied in the near future."

THE proprietors of the Aurora (Ills.) Gas Light Company have announced the following selling schedule, to take effect March 1st, 1898: 300 feet and under, per month, 55 cents; 400 feet and under, 65 cents; 500 feet and under, 75 cents; 600 feet and under, 85 cents; 700 feet and under, 95 cents; 800 feet and under, $1.05; 900 feet and under, $1.15; 1,000 feet and over, $1.25 per 1,000. On each bill less than 1,000 cubic feet a discount of 5 cents will be made, if paid on or before the 15th of the month at the office of the Company; and on each bill of over 1,000 cubic feet, for prompt payment, a discount of 5 cents per 1,000 will be allowed.

MR. MAURICE O'CONNOR, Gas Inspector for Chicago, proposes to institute "a rigid, unyielding and impartial system" for testing the gas supplied in that city. He has laid out quite a task for himself.

THE house or building which covered the plant of the Armitage Manufacturing Company (among other things the Company handles the ammoniacal liquor produced in the works of the Richmond city gas plant) was destroyed by fire some time ago. The Armitage plant was located close to the purifying house of the gas works, and when Mr. Armitage applied to the authorities for permission to reconstruct his establishment, the Light Committee of City Councils declared that the ammonia plant was a menace to the gas works. After some discussion it was finally decided that Mr. Armitage could reconstruct the ammonia plant, but that it must be at least 50 feet away from any of the gas works structures.

THE United Gas and Electric Company, of Dover, N. H., held its annual meeting early this month. The Directors chosen were: Albert Wallace, Fred. Richards, Geo. E. Wallace, B. C. Parson, George E. Macomber, Herbert L. Shepherd and John Kivel.

MR. GARDINER G. HUBBARD, whose death occurred in Washington, D. C., some days ago, was one of the original incorporators of the Cambridge (Mass.) Gas Light Company. Deceased, who was in his 75th year, was a son of Judge Samuel Hubbard, of the Massachusetts Supreme Court, and had been prominent in the affairs of the American Bell Telephone Company from the formation of that concern; at one time he was its President, and had served on its directorate since the naming of the original board.

THE Massachusetts State Inspector of Gas has examined the quality of the gas supplied from the new apparatus of the Southbridge Gas and Electric Company. He reports its illuminating value at 21 candles, and that in composition it conforms to the conditions prescribed by the statutes. The reduction in the gas rate at Southbridge (from $3 to $2.50), in force since the 1st inst., has been favorably received, judging from the expressions of approval heard in many Southbridge quarters.

THE terms of the franchise granted to the projectors of the Kootenay Gas Light and Power Company, which is the name of the concern that proposes to supply gas in Nelson, British Columbia, are as follows: (1) That the term of said franchise shall not exceed 10 years. (2) That a clause be inserted in said franchise whereby the corporation of Nelson shall have the right to purchase the plant of the said Company, paying a price to be arrived at by arbitration, plus a fair percentage for interest on investment. (3) That the said Gas Company pay the city of Nelson 2 per cent. on the gross earnings for the first year, 3 per cent. for the second, and 5 per cent. for the following years. (4) That the site of said works be subject to the approval of the City Council.

(*Continued on page* 974.)

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(*Continued from page* 973.)

(5) That the pipes be laid on all cross streets and alleyways, excepting where it is impracticable, when permission shall be given by the Council. (6) That a bond be given to repair all streets, etc., subject to the City Engineer's approval. (7) That gas be supplied at a cost not to exceed $2.50 per 1,000 cubic feet. (8) That a bond be given to the city that the Company commences operations within 90 days from the date of franchise and to complete the said works within nine months from the said date.

THE Baker City (Ore.) Company is meeting with much success. The main system is now not less than 8 miles in length, and the demand is constant for extensions.

Foreign Contracts for Pittsburgh.

Iron Age says that Mr. Thos. B. Riter, of the Riter-Conley Company, of Pittsburgh, has just returned from Europe, and while on the other side captured some very important contracts against strong English competition. These contracts include a steel building, steel smokestacks and the building of oil tanks of about 25,000 barrels capacity in Rotterdam, Holland. The contracts will approximate $150,000, and will require the employment of 14 or 15 skilled Pittsburgh mechanics abroad for some time. The oil tanks represent the first used in the extension of the foreign trade of the Pure Oil Company, a Pittsburgh concern. The tanks will be 80 feet in diameter, 36 feet high, and will be constructed of the heaviest steel. The roof will be steel framed and ¼ inch thick. The steel building will be erected in Dublin and will be used as the power house for the Dublin Tramway Company, who are changing from horse power to electricity. The building will be 250 feet long, 80 foot span and 30 feet high. It will contain an electric traveling crane of 15 tons capacity, improved coal conveyers, a coal storage plant and large boiler rooms. It will be one of the most complete traction power plants abroad. With it will be built two steel stacks, 200 feet high and 12 feet in diameter. Strong prejudice has been met in England to buildings of steel, and it is believed that the new plant in Dublin will cause a speedy adoption of modern buildings throughout the British isles. Three engineers connected with the Dublin Company visited New York some time ago, and became so impressed with the large power plants Riter & Conley had erected for the Metropolitan and Kings County Traction Companies that they requested Mr. Riter to go abroad with his engineer and explain the plans of the steel buildings to the London capitalists owning the tramway. The Riter-Conley Company are now figuring on considerable other foreign work and are receiving inquiries almost every day, these coming from South Africa, Ireland and the gold fields of foreign countries. Mr. Riter will go over again shortly after the first of the year to close up some more contracts, and also to establish branch offices on the other side, a step made necessary by the large amount of work they are already doing and other contracts which they expect to secure.

The Market for Gas Securities.

The market for city gas shares was active and lower during the week, a persistent drive at Consolidated, that culminated on Tuesday, being the feature. The minimum quotation was 175, after which a reaction carried the price back to 181½ on Thursday. The opening to-day (Friday) was 179 to 180. The postponed meeting of the shareholders in the New York and East River and the New Amsterdam Companies, set for the 14th, and which was called for the purpose of ratifying the agreement to combine the two interests in connection with the Equitable interest, was again postponed. The new date for the meeting is the 30th inst. While undoubtedly the differences that exist over certain matters in connection with the proposed consolidation are of a serious nature, we nevertheless believe that the parties to the merger are too far committed to do anything else than go ahead. The fireworks dividend operations by the Standard Company, under which extra dividends of 2 per cent. on the preferred and common, in addition to the regular payments, had the effect of increasing the quotations. The common is 140 to 143; the preferred is 148 to 155. A sale of Mutual (300 shares) at 300 is reported. The purchaser secured a bargain. Equitable is weaker, at 250, bid, and New York and East River common is 70 to 71.

Brooklyn Union is weak and dull, at 116½ to 117, but it is easily worth 125, on merit. Bay State was quite erratic, selling below 5 on the wonderful advertisement inserted in certain newspapers on the 14th inst. Further reference to this is made in our editorial columns to-day. Peoples, of Chicago, has been notably strong, although it sold off a trifle this morning. Consolidated, of Baltimore, continues weak, on reiterated rumors that a positive attempt to reduce the rate there to $1 per 1,000 will be made next year. Consumers, of Jersey City, is inquired for at 75, but holders ask 80 for it. Lacledes are fairly steady. It is thought that the Supreme Court decision affecting that Company will be handed down the first week in January.

Gas Stocks.

Quotations by Cochran & Close, Brokers and Dealers in Gas Stocks.

35 WALL ST., NEW YORK CITY.

DECEMBER 20.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$36,230,000	100	179	180
Central	500,000	50	..	..
" Scrip	220,000	..	100	.
Equitable	4,000,000	100	..	258
Bonds, 6's	1,000,000	1,000	105	.
" 1st Con. 5's	2,300,000	1,000	114	.
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	..	300
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	.	..	.
Northern	150,000	50	..	
" Bonds	150,000	1,000	..	98
New York and East River	5,000,000	100	70	71
Preferred	2,000,000	100	98	104
Bonds 1st 5's	3,500,000	1,000	112	113
" 1st Con. 5's	1,500,000	..	105	106½
Richmond Co., S. I.	348,650	50	50	..
" Bonds	100,000	1,000	..	..
Standard	5,000,000	100	140	143
Preferred	5,000,000	100	148	155
Bonds, 1st Mortgage, 5's	1,500,000	1,000	114	115
Yonkers	299,650	50	180	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	116¾	117
" " Bonds (5's)	15 000,000	1,000	112	112¼
Bay State	50,000,000	50	5	5¼
" Income Bonds	2,000,000	1,000	..	75
Boston United Gas Co.—				
1s Series S. F. Trust	7,000,000	1,000	93½	97
2d " " "	3,000,000	1,000	..	88
Buffalo Mutual	750,000	100	125	..
" Bonds	200,000	1,000	95	100
Central, San Francisco	2,000,000	..	95	..
Chicago Gas Company	25,000,000	100	97¼	97⅜
Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Columbus	1,069,000	.	91	94
1st Mortgage	1,085,000	..	..	96
Consumers, Jersey City	2,000,000	100	75	80
" Bonds	600,000	1,000	101	103
Cincinnati G. & C. Co	8,500,000	100	206	207
Consumers, Toronto	1,600,000	50	184½	187
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Consolidated, Baltimore	1,000,000	100	52¼	53
Mortgage, 6's	3,600,000	..	107	107½
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490,000	..	..	..
Detroit	4,000,000		55	57
" Con. Bonds	4,312,000	..	97	97½
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Fort Wayne	2,000,000	..	81	93
" Bonds	2,000,000	..	93	95
Hartford	750,000	25	..	145
Indianapolis	2,000,000	..	118	125
" Bonds, 6's	2 650,000	..	107	109
Jersey City	750,000	20	180	..
Lafayette Gas Co., Ind	1,000,000	100	86	88
Bonds	1,000,000	1,000	92	94
Louisville	2,570,000	50	..	..
Laclede, St. Louis	7,500,000	100	44	44¼
Preferred	2,500,000	100	92	95
Bonds	9,084,400	1,000	103	103½
Little Falls, N. Y.	50,000	100	..	100
Bonds	25,000	..	..	100
Montreal, Canada	2,000,000	100	200	.
Newark, N. J., Gas Co	1,000,000	..	200	220
Bonds, 6's	4,000,000	..	128	130x
New Haven	1,000,000	25	225	..
Oakland, Cal	2,000,000	..	53¼	54
" Bonds	750,000	..	..	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	95⅜	95½
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,00	1,000	..	108
2d "	2,500,000	1,000	104	105
Peoples, Jersey City	500,000	50	..	175
Rochester Gas & Elec. Co.	2,150,000	50	..	..
Preferred	2,150,000	50	88	..
Consolidated 5's	2,000,000		87½	90
San Francisco, Cal.	10.000,000	100	94	94½
St. Paul Gas Light Co	1,500,000	100	49	51
1st Mortgage, 6's	650,000	..	84	87
Extension, 6's	600,000	..	..	..
General Mortgage, 5's	2,400,000	..	88	90
Syracuse, N. Y.	2,500.000	25	20	23
Bonds	1,000 000		94	97
Washington, D. C	2,000,000	20	250	
Western, Milwaukee	4,000,000	100	83	85
Bonds, 5's	3,556,000	.	102	103
Wilmington, Del	550,000	50	200	203

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DIVIDEND NOTICE.

OFFICE OF WELSBACH LIGHT CO.,
DREXEL BUILDING, PHILA., Dec. 8, 1897.

The Directors have this day declared a dividend of One Dollar per share, payable Dec. 23, 1897, to stockholders of record at the close of business Dec. 14th. Checks will be mailed.

1175-2 EDWARD C. LEE, Treas.

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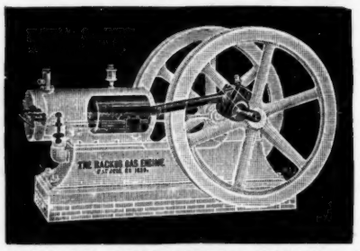

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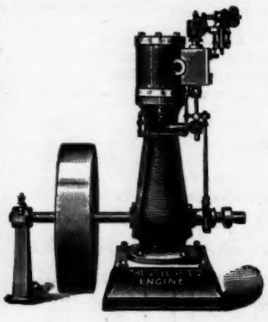

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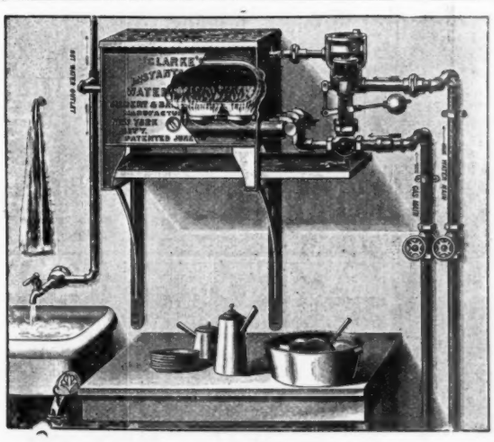

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Price, $50.00. 12 inches wide, 15 inches high, 30 inches long. Weighs 86 lbs.

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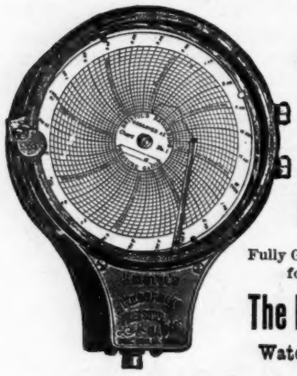

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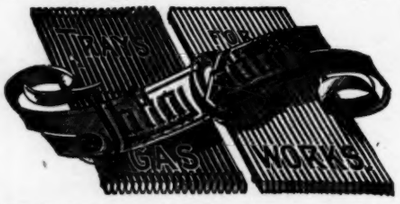

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The Patentees beg to refer Engineers to recent issues of the AMERICAN GAS LIGHT JOURNAL for testimonials as to the efficiency of their improvements and will be glad to quote for complete machines or for "grid segments" for fitting in old pattern Washer-Scrubbers, the manufacture to be English or American at enquirer's option. If for any *special reason* iron sheets are preferred, the Patentees will quote for them, but they do not recommend same.

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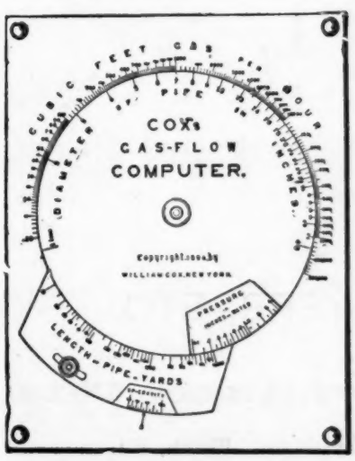

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1. It gives at a glance the discharge of gas from pipes 1 to 48 inches in diameter and 10 to 10,000 yds. long, for any pressure from 0.01 to 10.0 inches of water, and any specific gravity from 0.40 to 1.00.
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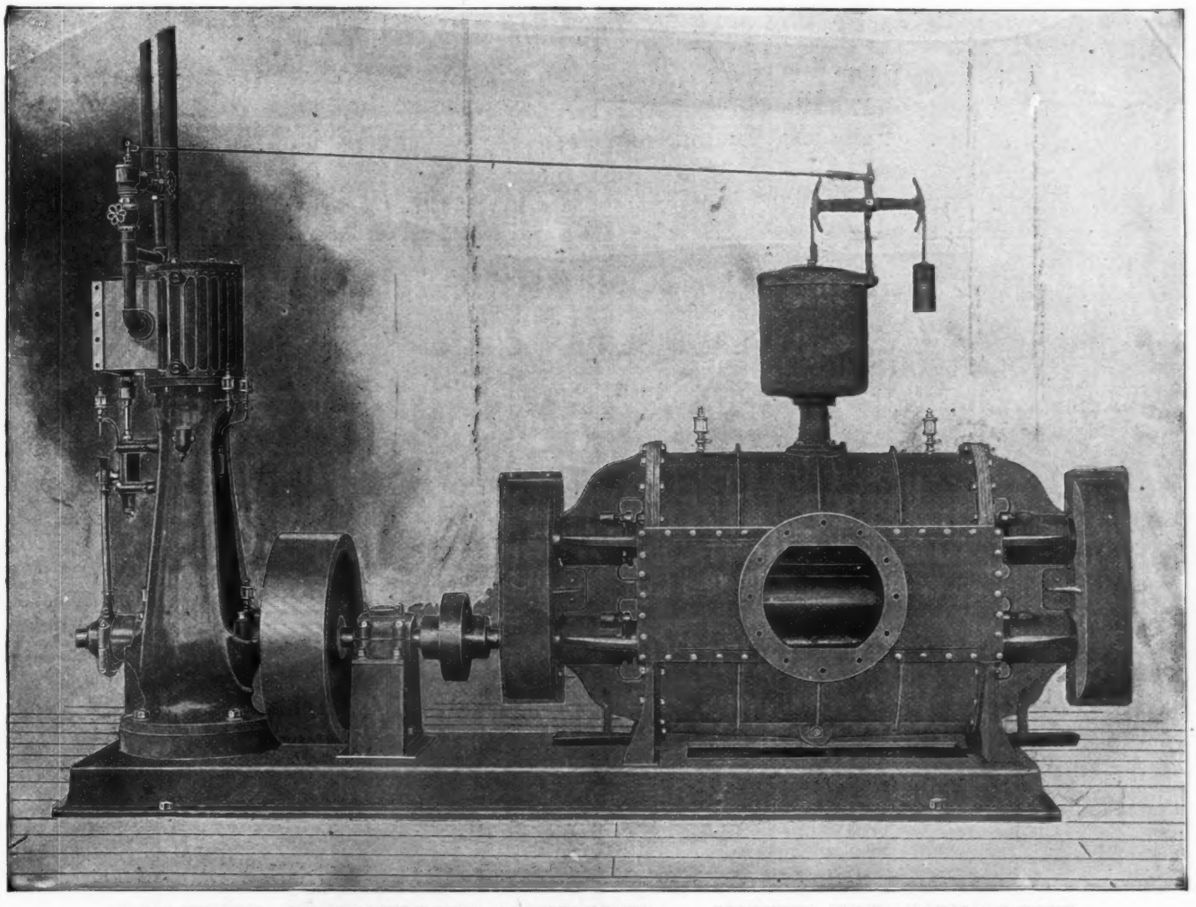

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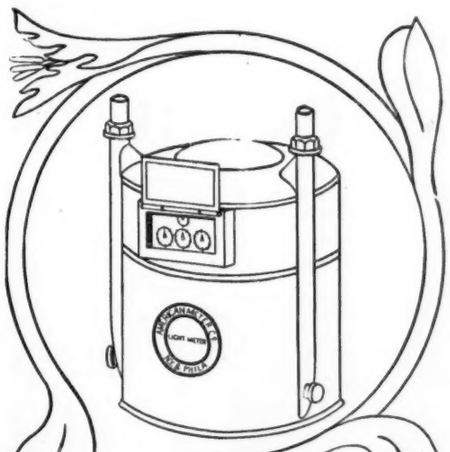

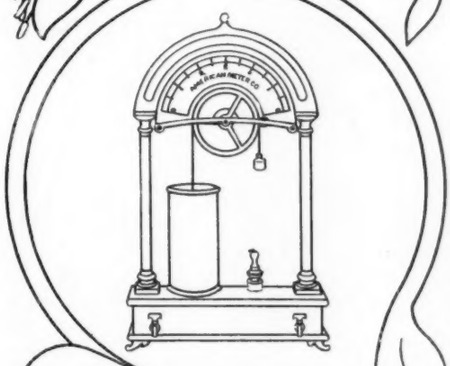

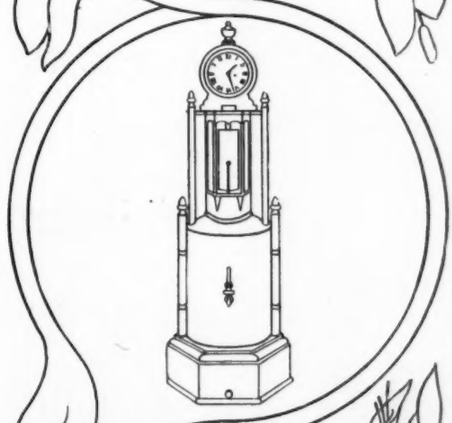

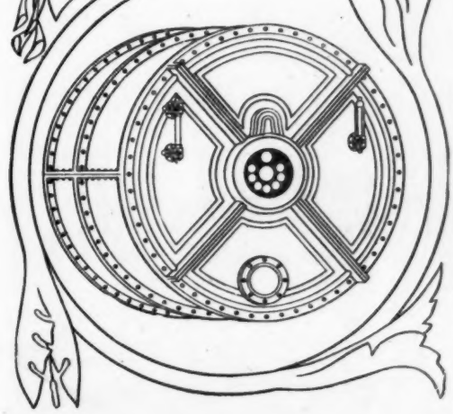

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SAN FRANCISCO.

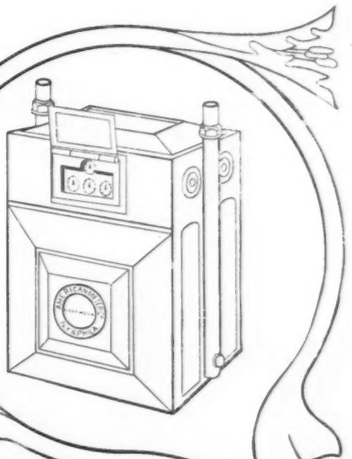
PUBLIC LIGHTING TABLE.

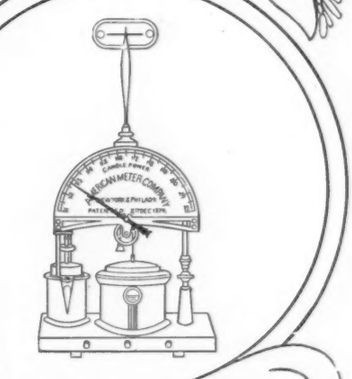
JANUARY, 1898.

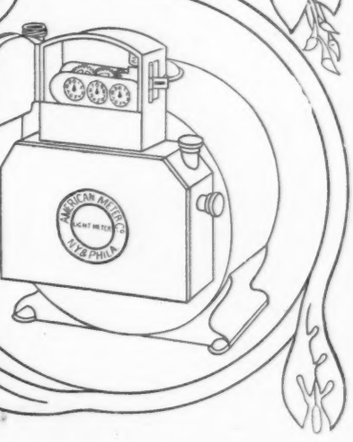
Day of Week.	Date.	Table No. 1. Following the Moon. Light.	Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Extinguish.
				P.M.	A.M.
Sat.	1	1.50 AM	6.20 AM	4.30	6.30
Sun.	2	2.50	6.20	4.30	6.30
Mon.	3	3.40	6.20	4.30	6.30
Tue.	4	4.40	6.20	4.30	6.30
Wed.	5	5.30	6.20	4.30	6.30
Thu.	6	No L.	No L.	4.30	6.30
Fri.	7	No L. FM	No L.	4.30	6.30
Sat.	8	No L.	No L.	4.40	6.30
Sun.	9	5.30 PM	7.40 PM	4.40	6.30
Mon.	10	5.30	8.40	4.40	6.30
Tue.	11	5.30	9.50	4.40	6.30
Wed.	12	5.30	10.50	4.40	6.30
Thu.	13	5.30	12.00	4.40	6.30
Fri.	14	5.30	1.10 AM	4.40	6.30
Sat.	15	5.30 LQ	2.20	4.50	6.25
Sun.	16	5.30	3.30	4.50	6.25
Mon.	17	5.30	4.50	4.50	6.25
Tue.	18	5.30	6.20	4.50	6.25
Wed.	19	5.30	6.20	4.50	6.25
Thu.	20	5.30	6.20	4.50	6.25
Fri.	21	5.30 NM	6.20	4.50	6.25
Sat.	22	5.30	6.20	5.00	6.25
Sun.	23	5.40	6.10	5.00	6.25
Mon.	24	5.40	6.10	5.00	6.25
Tue.	25	5.40	6.10	5.00	6.25
Wed.	26	9.30	6.10	5.00	6.25
Thu.	27	10.30	6.10	5.00	6.25
Fri.	28	11.30	6.10	5.00	6.25
Sat.	29	12.40 AM FQ	6.10	5.05	6.15
Sun.	30	1.40	6.10	5.05	6.15
Mon.	31	2.40	6.10	5.05	6.15

TOTAL HOURS LIGHTING DURING 1898.

By Table No. 1.	Hrs. Min.	By Table No. 2.	Hrs. Min.
January	210.40	January	423.20
February	186.40	February	355.25
March	181.20	March	355.35
April	166.10	April	298.50
May	156.40	May	264.50
June	144.30	June	234.25
July	147.30	July	243.45
August	157.10	August	280.25
September	169.50	September	321.15
October	186.00	October	374.30
November	204.30	November	401.40
December	218.30	December	433.45
Total, yr.	2129.30	Total, yr.	3987.45







To Whom It May Concern.

WE have learned that the makers of the "Sunlight" lamp assert that there has been a decision in the English Courts which saves them and their customers from liability as infringers of the Welsbach patents.

We assure the public there is no decision of any Court, in England or elsewhere, that directly or indirectly warrants the statement or inference that the lamp sold by the Sunlight Incandescent Gas Lamp Company of America is not an infringement of the Welsbach Light as made under the American patents, of which the Welsbach Light Company is sole and exclusive owner.

NOTICE is hereby given to all PURCHASERS and USERS of the so-called "Sunlight" lamp that suits will be brought against them for DAMAGES for INFRINGEMENT of the Letters Patent of the Welsbach Light Company, and will be prosecuted vigorously.

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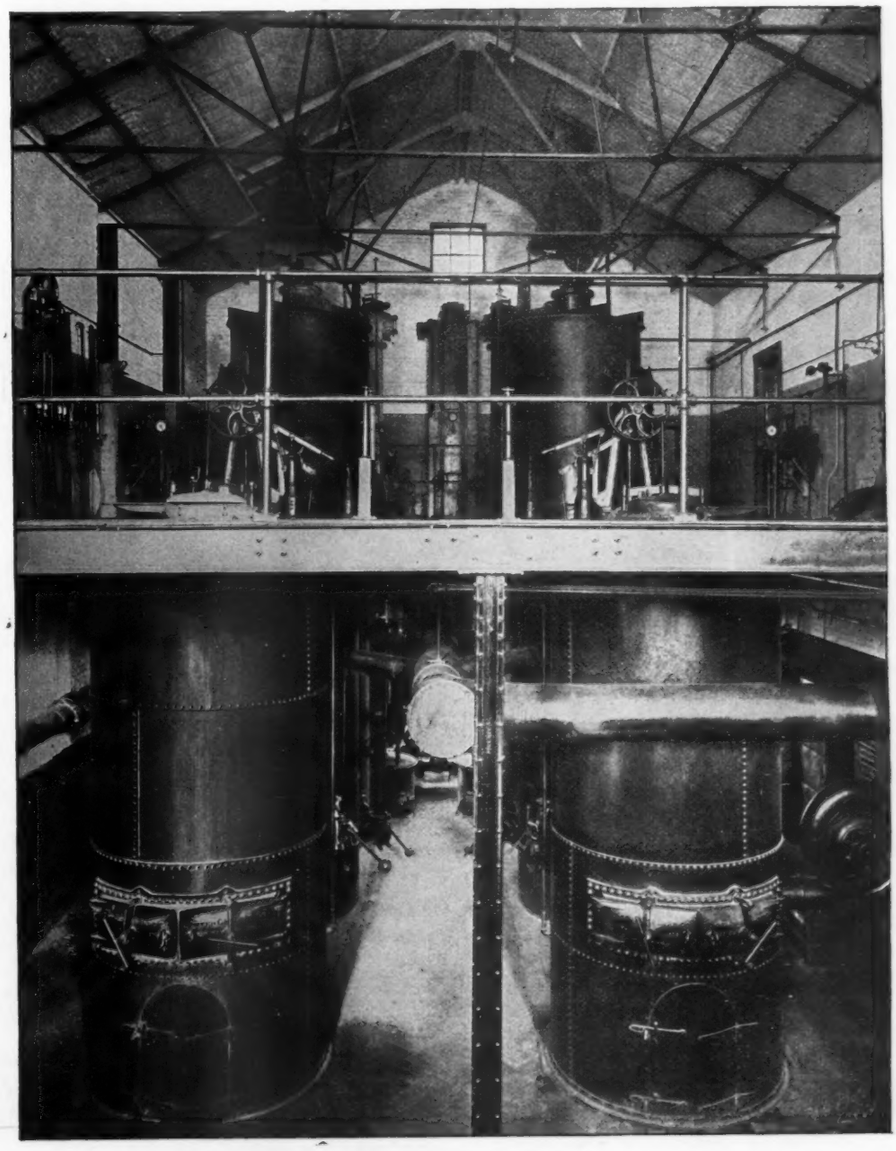
Standard Double-Superheater Lowe Water Gas Apparatus.

Number of Installations to Date, - - 240

Total Daily Capacity, 128,200,000 Cu. Ft.



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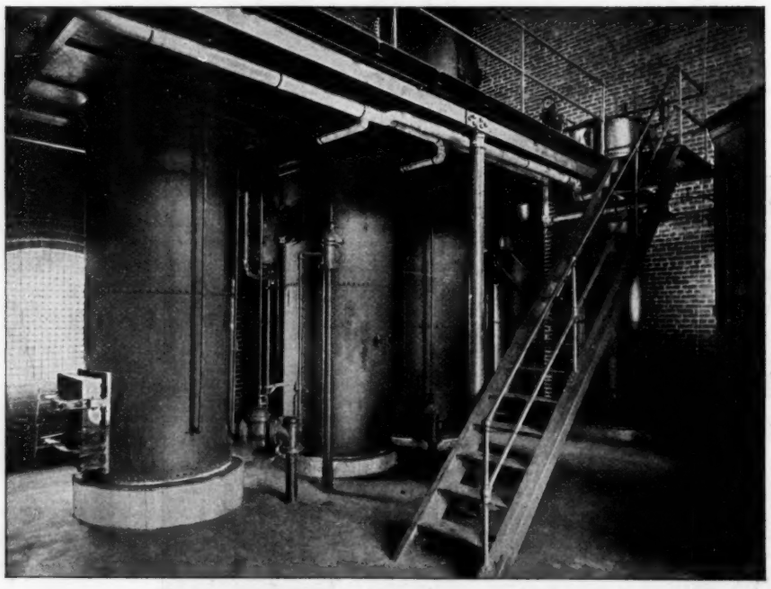

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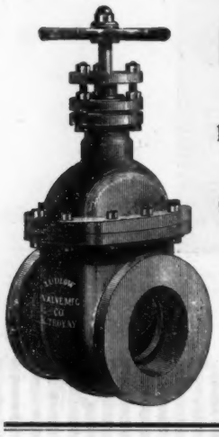

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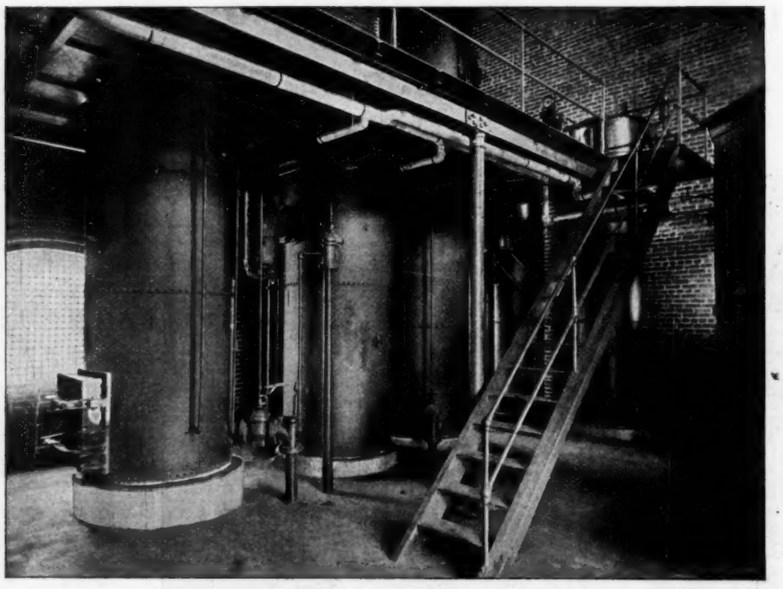

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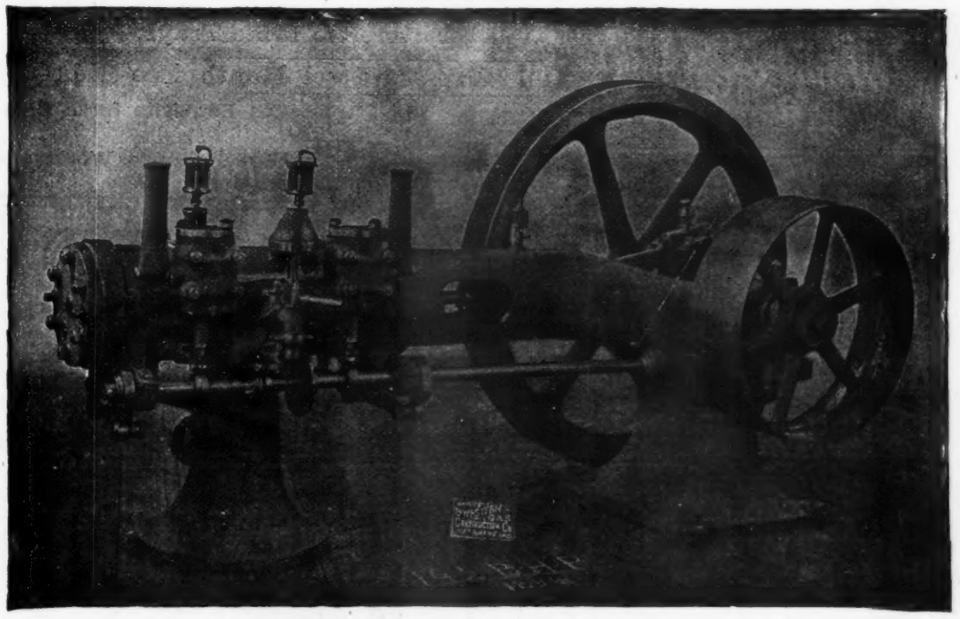

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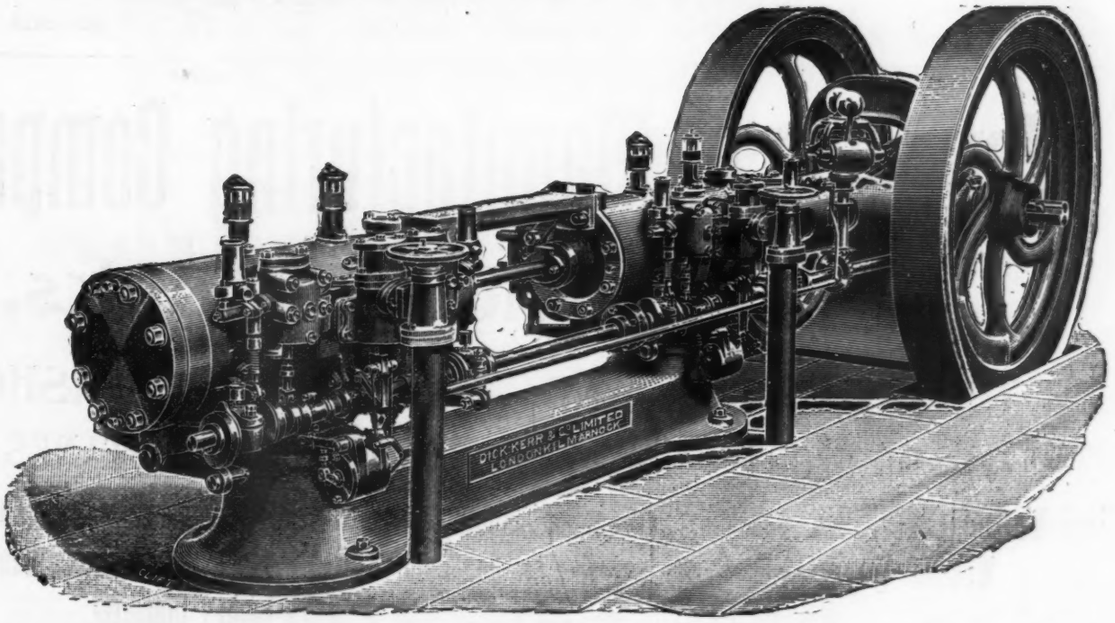

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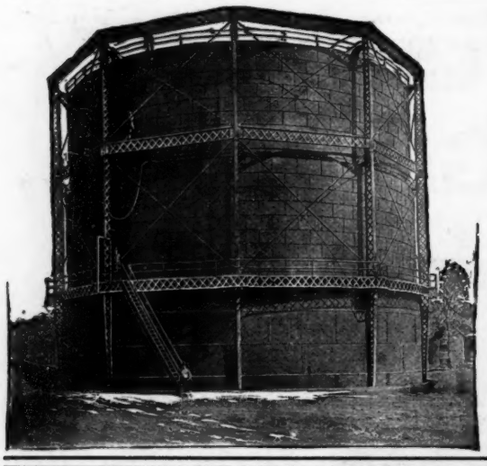

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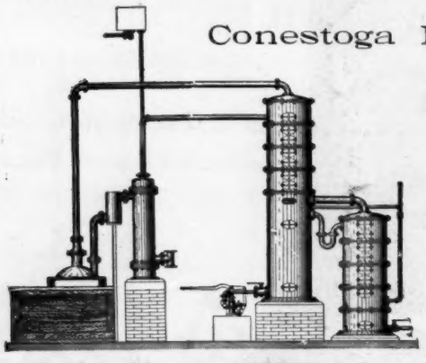

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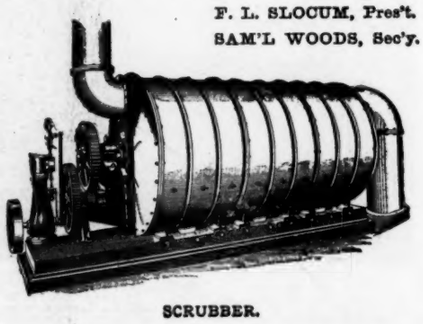

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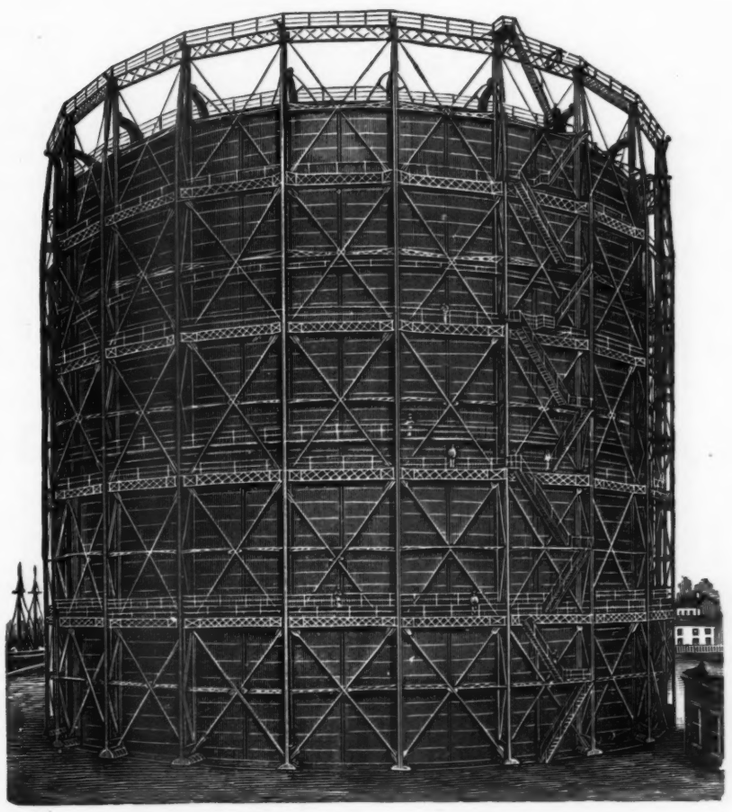

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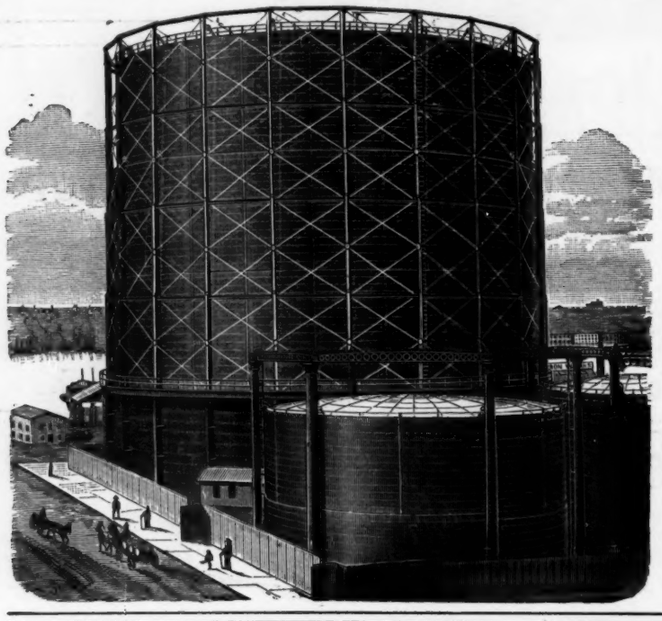

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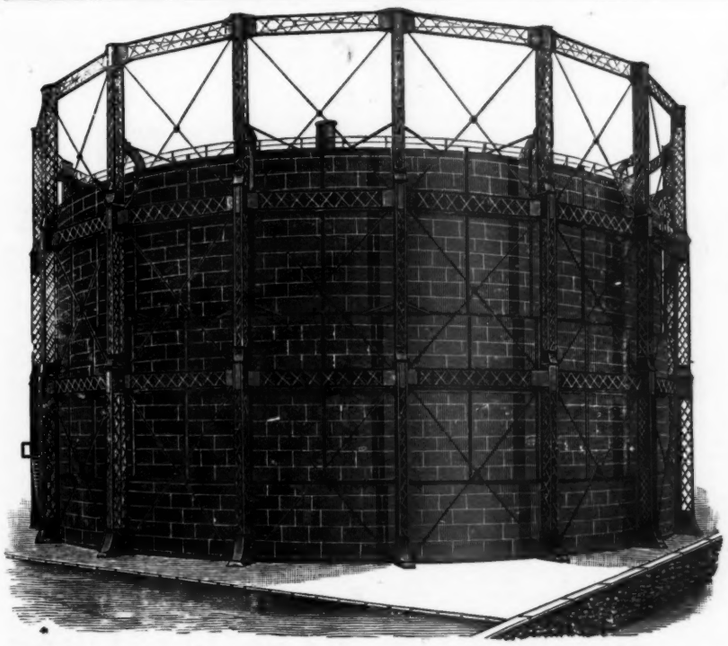

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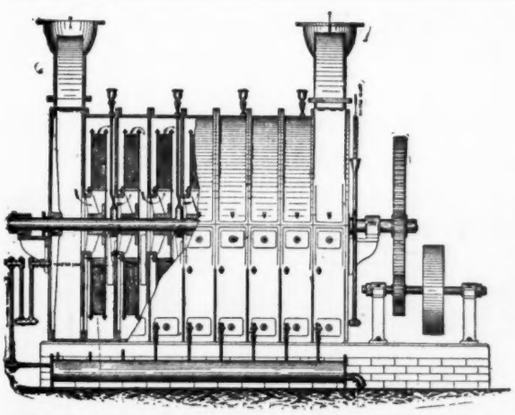

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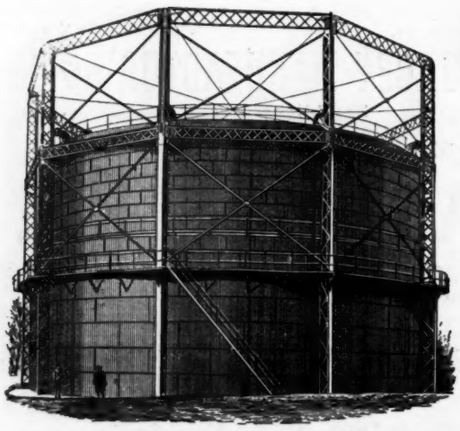

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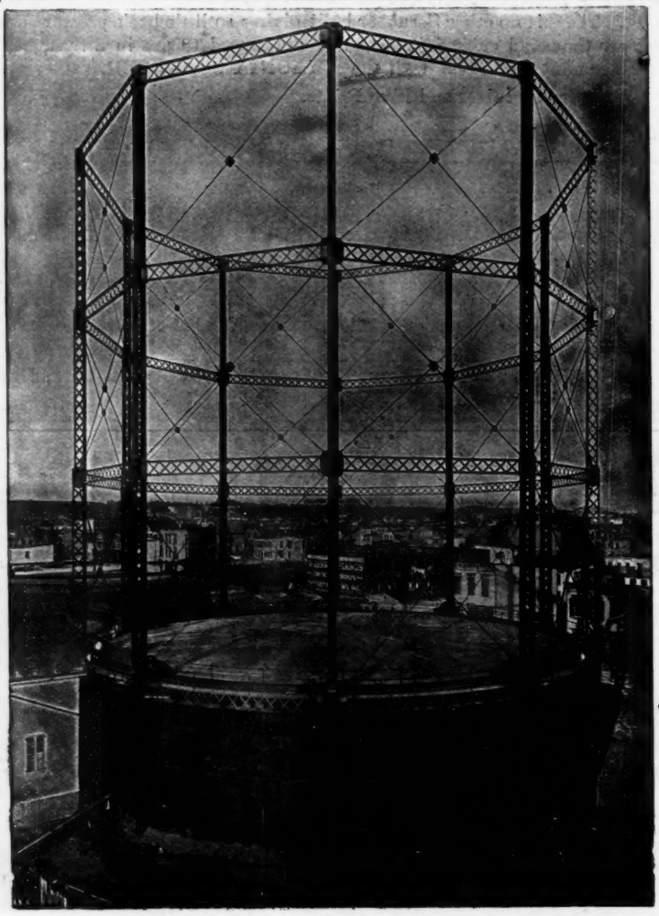

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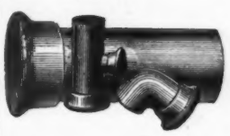

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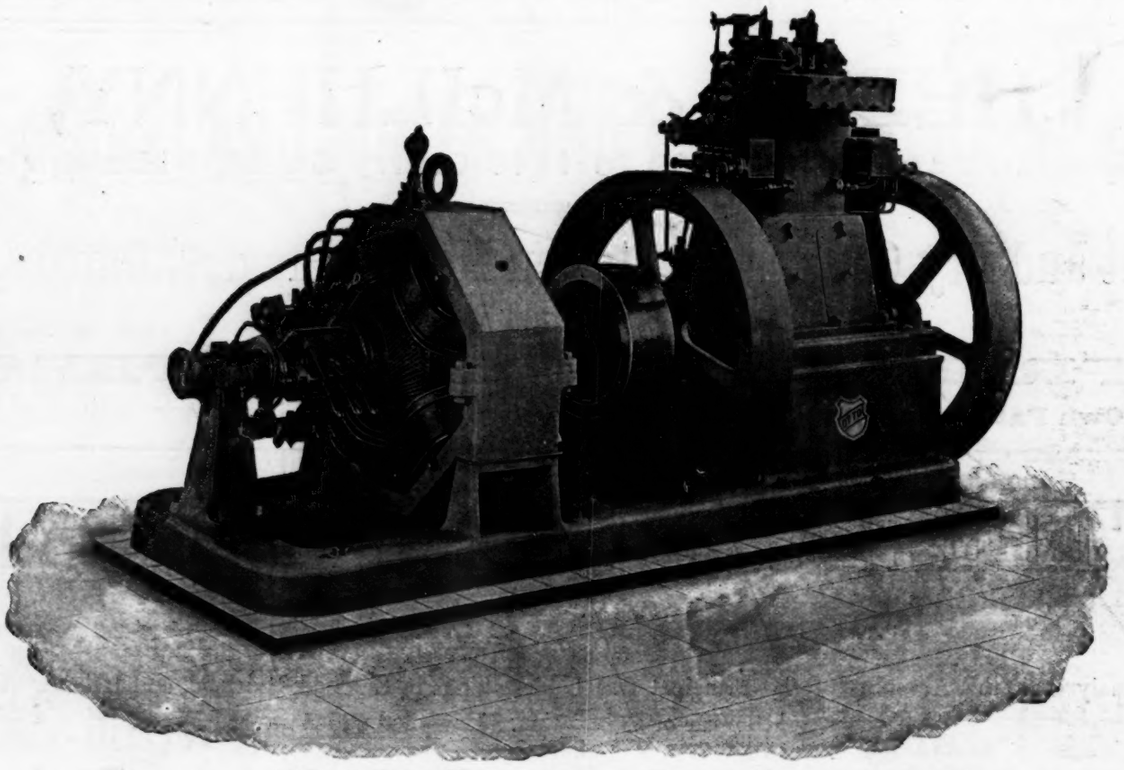

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